

From Community to Cabinet

TWO DECADES OF GEF ACTION TO SECURE
TRANSBOUNDARY RIVER BASINS AND AQUIFERS



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Foreword

▲ From fishing and supporting livestock to clean water for laundry and drinking, communities depend on freshwater for multiple uses, Lake Tanganyika, S. Marijnissen

In celebrating the results of the first twenty years of the GEF, the case studies described in this publication recognize the collaboration and trust essential to effective mutual action to reverse the degradation and depletion of our freshwater resources. These stories describe how the GEF has supported action at the local community level and reform at the national cabinet level, consistent with our pledges to help countries implement Chapter 18 of Agenda 21 and the Johannesburg Targets. The GEF's International Waters Focal Area offers a unique funding modality to tackle this tall order and catalyze the application of integrated approaches to the management of transboundary fresh water resources.

Transboundary water resources, whether rivers, basins or aquifers, link populations of neighboring countries and support the incomes and livelihoods of hundreds of millions of people worldwide. Sustaining the economic and social benefits from these transboundary water resources depends on the collective action of multiple countries. For many years governments failed to recognize this interdependency, leading to unilateral decision-making that has degraded and depleted many of our surface water and aquifer systems. Indeed, with GEF support, countries from all regions of the world have recognized the advantages of transboundary collaboration over unilateral action, whether such benefits are reached in

nations that share larger aquifer, river or lake systems.

Over the last twenty years there has been growing recognition that a nations' food, energy, health and environmental security depends on water resources that are shared with neighboring countries. With the assistance of the Global Environment Facility (GEF), governments have turned this recognition into collective action to secure the many benefits of transboundary water systems.

This publication highlights how GEF assistance in the application of innovative approaches has enabled mainland countries and Small Island Developing States to cooperate across different sectors toward the effective management of the world's transboundary freshwater basins and aquifers, replicating and expanding on these positive experiences before climatic extremes from global warming deepen, spreading social unrest and eroding global security.

The success we have realized to date points the way to a new imperative on collective action "from community to cabinet" to head off threats to domestic and international security sparked by water use conflicts. Inaction is no longer an option.



▲
Dr. Naoko Ishii, CEO and Chairperson,
Global Environment Facility



Introduction

Water is the lifeblood of our planet but the global community has often avoided the complexity of water management because other issues, such as climate change, human health and biodiversity appear much more urgent. But it is our water systems that help to nourish the very ecosystems that support life. Food security, public health and economic opportunities are all dependent on the way we manage our shared water resources and human life itself is dependent on the supply of drinkable water.



INTRODUCTION

In recent decades our planet's freshwater sources have been rapidly degraded by a range of global pressures such as population growth, food shortages and a changing climate. For example, wasteful crop irrigation practices from surface water and aquifers deplete available water resources and excessive run-off leads to water quality degradation which impoverishes downstream communities.

In 1991 the Global Environment Facility (GEF) was set up as a pilot grant facility. The GEF is the largest financial institution with the mandate, ability, and experience to address current and future challenges to shared freshwater systems. The GEF International Waters focal area was established to help countries work together to resolve growing tensions over large water systems. The focal area helps countries collectively manage, and share the benefits from their transboundary surface water and groundwater basins.

In its first two decades, the GEF has supported over 250 projects in International Waters with ten partner agencies¹. These projects have helped 149 GEF recipient countries and 24 non-GEF recipient countries build the trust and confidence to work together on their shared freshwater and marine systems.

The GEF's pioneering approach has enabled greater collaboration in the management of water resources by multiple countries, institutions and communities. By working from "Ridge to Reef", the GEF freshwater basin and aquifer projects continue to help communities to sustainably balance the competing uses of their water resources and promote regional integration and political stability.

THE GEF'S PIONEERING APPROACH HAS ENABLED GREATER COLLABORATION IN THE MANAGEMENT OF WATER RESOURCES BY MULTIPLE COUNTRIES, INSTITUTIONS AND COMMUNITIES.

The GEF approach recognizes that sector-based approaches alone are insufficient to address water conflicts caused by multiple stresses. In order to overcome this complexity the GEF has developed a pragmatic approach that has enabled countries to work across borders and divide their problems into manageable actions at both the community and cabinet levels.

First developed in GEF projects addressing the freshwater concerns of Small Island Developing States, the twin concepts

of "Ridge to Reef" and "Community to Cabinet" have been applied across the International Waters portfolio with great success and high levels of engagement from participating countries.

An integral part of these multi-country initiatives has been the GEF's support of projects to demonstrate how communities can improve both their incomes and health while balancing competing uses of their water systems.

The following pages present the impacts of GEF-supported projects that contribute not only to community water security but also regional integration, stability and peace among neighbouring countries. In these case studies innovative technologies have been successfully tested, new water-related treaties have been adopted and far-reaching reforms have been introduced, reversing the problems of water quality degradation and water flow depletion.

With the dual threats of global warming and globalization, there is a new imperative for governments to scale up these GEF successes so that further adverse economic and social impacts can be minimized and water security assured for the future.

¹ The UN Development Program (UNDP); The UN Environment Program (UNEP); The World Bank; The UN Food and Agriculture Organization (FAO); The UN Industrial Development Organization (UNIDO); The African Development Bank (AfDB); The Asian Development Bank (ADB); The European Bank for Reconstruction and Development (EBRD); The Inter-American Development Bank (IADB); and The International Fund for Agricultural Development (IFAD).



▲ Traditional boats rely on clear waterways. In Lake Victoria, water hyacinth, an invasive species, and algae blooms have threatened traditional livelihoods, A. Dansie

A Legacy of Transboundary Water Management



▲ In Usoma, Kenya on the shores of Lake Victoria proper water usage starts at the community level.
A. Dansie

The GEF International Waters focal area is about trying to build confidence and trust amongst countries so that they can commit to working together on their shared waters. Since 1995, the GEF's work has shown that countries collaborate successfully when they realise that the shared benefits from cooperation will be greater than unilateral planning and action.



IMPROVING TRANSBOUNDARY WATER COOPERATION

THE MAIN ISSUE THE INTERNATIONAL WATERS FOCAL AREA ADDRESSES

The Green Revolution and the process of growing more food in the 1970s and 1980s led to massive depletion of the planet's rivers and aquifers. In addition to this, agricultural pollution made the existing pollution pressure from cities and industries even worse. The impacts of climate change, floods and droughts, combined with bad farming and planning practices since have created additional pressures leading to often disastrous situations for communities.

Of all the GEF focal areas, International Waters is most closely aligned with overall development assistance objectives, because sound management of freshwater basins and aquifers is largely about avoiding sector development conflicts and balancing competing sector water uses.

Whether you consider an island in the Pacific or a coastline in Africa, the issues and the needs of the people are the same. People need to feed their families and make a living. Communities need housing and shelter and don't want to be constantly threatened by floods or droughts.

HOW THE INTERNATIONAL WATERS FOCAL AREA HELPS ENHANCE REGIONAL SECURITY

The GEF International Waters focal area aims at building confidence and trust amongst countries so that they can commit to working together on their shared waters and related natural resources.

The GEF's work has shown that countries collaborate successfully when they realise that the shared benefits will be greater than they would be if they each pursue their own purely national water resources development goals.

Virtually everything the GEF has funded has implications for the security of food, water, energy and the economic and health needs of communities. Irrigation and food production use almost 80% of our water resources and many conflicts already relate to irrigation demand in the agriculture sector. If the world is to sustainably feed its future population then we need to start talking about enhancing the regional security of our water and our wider environment.

The GEF International Waters focal area is about creating a common understanding

on the competing water needs on the one hand and the gains from cooperation for each country on the other. Ultimately, sustainable, integrated management of water resources will require cross-sector collaboration and sector reforms in each country so that conflicts can be avoided in river basins or aquifers. Countries have to act nationally, but if they also take similar collective action, then they have a much greater chance of avoiding or resolving water conflicts.

Of all the GEF focal areas, International Waters is the most associated with development assistance because freshwater basin and aquifer issues are all about avoiding sector development conflicts and balancing competing sector water uses.

HOW DOES THE GEF INTERNATIONAL WATERS FOCAL AREA WORK?

Since 1995 the GEF International Water Focal area has helped to support 234 projects totalling \$1.3 billion of GEF funds with co-financing of around \$7.7 billion. The GEF Secretariat doesn't actually undertake the projects. The so-called GEF agencies (UNDP, UNEP, World Bank, IFAD, FAO, UNIDO, EBRD, IADB, AfDB and ADB), have field offices with expertise to implement the projects within their programs of support agreed with each country.

During the 1990s and 2000s the GEF was has supported countries to successfully implement and demonstrate innovative approaches for the joint management of water systems. These GEF funded demonstration projects and programs show that countries can address transboundary concerns both at regional and at the national scale and at the same time enhance livelihoods of their people and the economic returns from interventions. While this is a success, the scale of transboundary water issues – such as increasing water scarcity and decreasing quality of surface, groundwater and oceans – requires upscaling and mainstreaming these approaches by national governments, regional institutions, as well as the GEF agencies and other development partners. Without this, the

water situation will quickly become increasingly bleak, especially with new demands for food and water brought about by climate change and global economic pressures.

THE UNIQUE APPROACH OF GEF'S INTERNATIONAL WATERS FOCAL AREA

In 1995 the GEF Council represented 140 countries and now there are 186. In view of the insufficient amount of available resources through the GEF International Waters focal area, the GEF Council decided that a strategic and demonstration-based approach is needed for International Waters funds to best serve country needs. The GEF realizes that it is the countries' responsibility to resolve water use conflicts or fully clean up rivers. The GEF's role is to support countries in finding common ground and creating sustainable institutional mechanisms to work together on their shared water and related resources, to demonstrate that conflicts over these shared resources can be addressed through cooperation and that this can be done cost effectively.



PARTICIPATION HAS BEEN IMPORTANT FOR THE INTERNATIONAL WATERS PROJECTS

The focal area operates under the maxim from "community to cabinet" which originates from the Pacific Region. Experiences from GEF support over the years shows that benefits from cooperation need to be tangible on a local and community scale in order to convince policy makers to engage in long-term, larger transboundary cooperation. Such successes on the community level are seen by sector ministry staff who will then be able to showcase to their ministers and parliamentary colleagues across sectors that coordinated and/or coopera-

▲ Training on Groundwater and its management at community level in South Africa

tive action in terms of both investments and national reforms leads to greater benefits for each country than unilateral action. It is therefore important for all stakeholders involved to realize that it takes considerable time for countries to go through the political processes and reach the shared understanding of the tangible benefits that will accrue from cooperation. The GEF's International Waters strategy therefore allows for both, projects that facilitate building these foundations of shared understanding through transboundary analysis and adoption of agreed action plans and supports projects

and programs for implementation of strategic action programs.

TIMEFRAME OF INTERNATIONAL WATERS PROJECTS

It often takes at least a decade in order to deal with multiple stresses across large scale water systems and complex history and processes of multi-county dialogue. In many cases it takes a five-year project just to assist the different governments to work together to understand the water situation and to agree to commit to working together. It then takes another five-year project to undertake local demonstration projects and to start the process of building stronger institutions and undertake sector reforms.

In order to accelerate the process of understanding constraints and needs and to overcome shorter political timeframes the GEF tries to involve the science community at earliest stage. The shared technical process of developing a Transboundary Diagnostic Analysis allows countries to analyse the real water situation across sectors and countries. GEF support requires that a transparent participation process be used that allows different ministries and civil society stakeholders to understand issues that will be critical to them not only at present, but ten or twenty years down the road. This is the foundation

for the formulation and common adoption of a Strategic Action Program which is designed to address such long-term issues. Buy-in and adoption at the ministerial level of a long-term vision and a Strategic Action Program is a necessary pre-requisite for requesting additional GEF funds for implementation of the program at both regional and national levels. Only once such actions are agreed upon at the regional and national levels, will GEF be ready to provide further support.

KEY TRANSBOUNDARY WATER PROBLEMS THAT NEED TO BE ADDRESSED IN THE FUTURE

While transboundary surface water issues are already complex, the world community needs to work even harder to protect and properly manage our transboundary aquifers. About 97% of all the available non-ice freshwater on earth is below the ground and what people see in these huge rivers and lakes only accounts for about 3% globally. These aquifers are a critical resource in dealing with the impacts of climate change. But they are being lost at a rapid pace.

Countries also need to find effective ways to address the conflicts that are already occurring because of the competing water uses in basins or aquifers between the needs for environment, water, food and energy. This cannot be done by the water sector alone –

all sectors need to work together nationally and across borders and incorporate needed water considerations. GEF is focusing on supporting long-term programs that work across the different sectors and increasingly does this hand in hand with other GEF focal areas like land degradation, biodiversity, and climate change. If development partners continue to fund individual projects with the agricultural sector or the environmental sector alone, water related conflict will not be avoided.

The GEF International Waters portfolio of support to international river basins, aquifers, and large marine ecosystems has already demonstrated effective ways of dealing with water and natural resource use conflicts in an open manner; this is encouraging and shows that countries can take more effective action and scale-up GEF project results.

Finally, *prevention* of use conflicts and *avoiding* environmental degradation needs to be recognized as being much less expensive than taking the reactive approach of trying to resolve conflicts later. Both country governments and development partners, including the UN agencies, multilateral banks, and bilateral donors are starting to take more preventative approaches to support countries in reducing or – if possible - prevent damage from reoccurring droughts, floods, and storms that are currently

The dynamic of improved confidence and trust that is produced among the people working on all the GEF water projects I have seen has been the biggest thrill that I've had. To experience that enthusiasm and that development in a shared understanding and trust really gives me great hope for the future.

AL DUDA, RETIRED SENIOR ADVISOR FOR THE GEF INTERNATIONAL WATERS FOCAL AREA FROM 1995 TO 2012

devastating many national economies. Governments simply cannot afford to keep taking billion dollar hits from natural disasters and a preventative approach is the only way to embed real resilience and sustainability into water systems.

HOW INTERNATIONAL WATERS PROJECTS HELP TO BUILD CAPACITY IN NATIONAL INSTITUTIONS

The GEF supports country driven projects where people are learning through the participatory process and doing the technical work of putting together a diagnostic analysis or implementing practical demonstration work with communities. This has led to enhancing institutional capacities as well as building individual careers. There are many examples of people who have worked on International Water programs now working as deputy ministers or as high level decision-makers and managers within their governments.

This approach has for example proven to be highly successful within the GEF/UNDP/SOPAC *Pacific Integrated Water Resources Management Project*, which helps island nations to protect their surface and ground water supplies.

Alfred Duda, GEFs International Waters Lead Specialist pictured here with the Nandi IWRM Demonstration Project Manager Mr Vinesh Kumar, prior to his retirement from GEF, M. Wilson.





Enhancing Regional Security in the Danube River Basin

▲
The Danube River in
Budapest, V. Melo

In supporting the recovery of the Danube and Black Sea, the GEF has played a central role in one of the most remarkable success stories in water quality improvement and regional cooperation the world has ever witnessed. The Danube represents only one case among many in which GEF's timely assistance has helped to contribute to regional stability and a cooperative management framework to a river basin shared by countries experiencing post-conflict reconstruction.



ENHANCING REGIONAL SECURITY IN THE DANUBE RIVER BASIN

Growing levels of nutrient and organic pollution from agriculture fertilizer, livestock waste, and human sewage discharged to the Danube basin reached a peak in 1990 when about 40,000 km² of the Black Sea was considered “dead”, where a lack of dissolved oxygen resulted in a massive loss of aquatic life.

Starting in 1991, the GEF/UNDP *Danube Basin Environmental Management Program* helped Danube countries generate \$3.5 billion worth of investments to improve agricultural practices, municipal wastewater treatment and the management of important wetland areas. Thanks to this program the Black Sea dead zone has been virtually eliminated, nitrogen emissions have fallen by 20%, phosphorus by 50%, and the number of species has almost doubled from 1980 levels.

Katherina Reiche, Parliamentary State Secretary for Germany’s Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, believes the support provided by the GEF played a significant role in strengthening both the environment and the political stability of the entire Danube region.

“Building on the political momentum of the fall of the Iron Curtain, the GEF Danube Regional Project played a catalytic role in helping the countries to make full use of policy, legal and institutional reforms and to increase their capacities for the protection and sustainable use of shared water resources”

KATHERINA REICHE, PARLIAMENTARY STATE SECRETARY, FEDERAL MINISTRY FOR THE ENVIRONMENT, NATURE CONSERVATION AND NUCLEAR SAFETY, GERMANY

“In the field of water management, the GEF project and its cooperation with the ICPDR (International Commission for the Protection of the Danube River) paved the way for the EU accession of the Danube countries.

“Building on the political momentum of the fall of the Iron Curtain, the *GEF Danube Regional Project* played a catalytic role in helping the countries to make full use of policy, legal and institutional reforms and to increase their capacities for the protection and sustainable use of shared water resources.

“In 1991, of all countries in the Danube river basin only Germany and Austria were EU Member States. Today the Czech Republic, the Slovak Republic, Slovenia, Hungary, Romania and Bulgaria have joined the EU and Croatia will follow next year. This clearly shows how much the stability of the Danube region has been strengthened,” she says.

The Danube river basin now provides a successful model of Integrated Water Resource Management (IWRM) that can be applied to other transboundary water systems around the world.



Fisherman on the Danube, V. Melo.



▲
Budapest University on shores
of the Danube, V. Melo .

“Since 1991 the GEF investment in the Danube has clearly demonstrated that shared water systems provide a great platform to enable countries to build the trust and confidence needed to work together. In the Danube we have seen that, if people can find ways to work together to achieve shared environmental goals, they can also start to see the benefits of greater social and economic cooperation,” Ivan Zavadsky says.

The work of developing institutional capacity and harmonizing EU laws continued even as two wars were being fought between countries from the former Yugoslavia. During this conflict the GEF’s ongoing work to enable technical cooperation among these Balkan countries also helped to facilitate greater political dialogue.

GEF assistance was there from the very beginning to help countries build the all the necessary technical capacity, tools and means for transboundary cooperation to take place.

“After 15 years of support from the GEF and the European Commission we now have a technically and institutionally strong Danube Commission and the Danube countries are now standing confidently with solid environmental regulation and real investments being made to try and meet their own environmental needs,” he says.

The political will of the Danube countries and the EU was needed to jointly sign and ratify the Danube River Protection Convention in 1994. In 1998, the ICPDR was established as the main implementing body of the Danube Convention. Following its establishment the GEF focused on assisting the ICPDR to implement the EU’s Water Framework Directive (WFD) which obliges EU member states and accession countries to use a river basin approach for managing their water resources.

When non-accession countries also agreed to abide by the WFD this meant that all Danube countries would be effectively guided by one common overarching regional water-related legal framework. And State Secretary Reiche is in no doubt about the importance of the GEF’s role in enabling regional implementation of the WFD.

“Given the complexity of the Danube river basin – the many countries, differences in economic performance, biological assets, past damage and continued threats from human impacts – it was clear that one overall framework was required to sustainably manage the basin environment. The EU Water Framework Directive provides for such an integrated and innovative approach in river basin management. Without the financial and technical support of GEF the ambitious standards and objectives of the

“Since 1991 the GEF investment in the Danube has clearly demonstrated that shared water systems provide a great platform to enable countries to build the trust and confidence needed to work together”

IVAN ZAVADSKY, SENIOR
WATER RESOURCES
MANAGEMENT SPECIALIST, GEF
INTERNATIONAL WATERS

Water Framework Directive would not have been achievable throughout the basin,” she says.

Since its creation, the ICPDR has grown into one of the largest and most active international bodies of experts on IWRM in the world, promoting policy agreements and setting joint priorities and strategies to improve the basin. This permanent, financially sustainable body is vital to maintaining continuity, momentum, and country

commitment to IWRM. State Secretary Reiche says the GEF has helped the ICPDR to develop a truly integrated approach to managing the entire river basin.

“The most important aspect may be that all these activities not only turned the Danube into a classic example of Integrated River Basin Management, but also reinforced the political stability of the whole Danube region.”

KATHERINA REICHE, PARLIAMENTARY STATE SECRETARY, GERMAN FEDERAL MINISTRY FOR THE ENVIRONMENT, NATURE CONSERVATION AND NUCLEAR SAFETY

“The GEF project - working in close cooperation with the ICPDR - enabled monitoring and assessment of data, generated cross-sector dialogue, changed habits, induced investments, promoted public participation and stakeholder involvement and created

ownership by people and governments. The most important aspect may be that all these activities not only turned the Danube into a classic example of Integrated River Basin Management, but also reinforced the political stability of the whole Danube region.” she says.

The GEF’s support for greater cooperation in the Danube is well illustrated by the development of an accident emergency warning system which has enabled national authorities to collaborate more effectively to minimize the impacts of industrial accidents and other emergencies. In January 2000 this warning system enabled Hungary to open sluices and dilute a massive plume of cyanide that had entered the country following a mining accident in Romania.

In 2007 the ICPDR was awarded the International Theiss River Prize for excellence in the management, preservation, and restoration of the Danube River Basin. The management of the Danube River Basin is now also celebrated as a global example of “transformational change” where countries have worked together successfully to institutionalize effective policies, programs and projects within their own national strategies. In 2005 the European Union provided the GEF with the highest of accolades when it highlighted the Danube program as a model for transboundary water governance in its

report to the United Nations Commission on Sustainable Development.

SUPPORTING PUBLIC PARTICIPATION

In many of the former communist countries along the lower Danube public participation in environmental decision-making was virtually non-existent before 1990. After years of state secrecy the citizens of these countries faced considerable barriers accessing information about their own environment and water resources.

In order to build effective IWRM throughout the Danube river basin the GEF quickly realised the need for countries to support greater public involvement in the environmental decision-making process. The GEF was one of the first organisations that worked to help government officials and NGOs find practical ways to build greater access to information required by the EU and the Aarhus Convention.

In 2000 the GEF provided support for a \$1.5 million pilot project to help government officials and NGOs in Hungary and Slovenia to improve public access to environmental information and increase public participation in environmental decision-making. This project was implemented by a partnership including the Regional Environmental

Centre for Central and Eastern Europe and the New York University School of Law, with implementation by the United Nations Development Programme.

The pilot project helped to improve communications between NGOs and government officials by both building skills and providing direct technical assistance. Key measures included the development of handbooks to help government officials carry out their responsibilities and guides to help citizens improve their access to water-related environmental information. The project also developed a user-friendly manual identifying good practice in countries with long standing public participation programs such as the Netherlands and the United States.

The pilot project helped to increase the power of NGOs and citizens to conduct information campaigns and influence public policy. For example, improved collaboration between Hungary’s Clean Air Action group and the Central Danube Valley Water Authority helped to quickly resolve a problem around illegal timber logging in the Danube river valley. The pilot also enabled Slovenia’s Regional Environmental Centre to generate additional donor funding needed to support its efforts to assist the Slovenian government to ratify and implement the Aarhus Convention in 2004.

In 2004, based on the success of this first pilot, the GEF extended support for a new \$1.5 million project to develop practical guidelines for public officials and NGOs to encourage greater public involvement in river basin management planning in Bosnia and Herzegovina, Bulgaria, Croatia, Romania, and Serbia.

Mr. Zavadsky believes the GEF approach also helped the participating governments to understand the wider value of working in partnership with NGOs.

“This project helped many regulators and policy makers in these countries to make a significant shift in the way they had viewed NGOs in the past. Many government organisations began to realise that NGO groups were genuine partners that they could work with on a number of issues. They also began to understand that this greater transparency would also help to lead to more solid environmental regulation and to greater investment into the control of water pollution,” he says.

As a result of this GEF support, the NGOs and citizens in the participating countries became more skilful in obtaining information and developing the tools they needed to actively participate in environmental planning and decision-making. In all five countries NGOs were supported to develop demonstration projects that focused on



directly local pollution hot spots on the Danube.

In Croatia, the demonstration pilot supported greater community involvement in water pollution issues through the creation of a multi-stakeholder water forum in the town of Osijek.

The NGO, Green Osijek, was concerned about the impacts of untreated wastewater on the Drava River. With no centralized water treatment system 500 m³ of untreated wastewater and most industrial wastewater was being pumped into the Drava every day.

▲ Ministers adopted the Danube River Basin Management Plan at the Ministerial meeting of Danube Countries in Vienna, February 2012, ICPDR

With GEF support, Green Osijek established the Osijek Water Forum involving stakeholders from government, industry and the public. The Forum helped to encourage a more open approach for coordinating the flow of information, and directly supported activities to address key priorities including the need for greater public involvement in the planning of Osijek's proposed new wastewater treatment plant.

Mr. Zavadsky believes that the GEF support for all the demonstration projects has had far reaching impacts on improving ongoing dialogue and environmental governance throughout the region.

"All of the participating countries were able to use GEF support to create a more

balanced dialogue on issues affecting the Danube where the regulatory agencies, industry and citizen interests groups could sit at the table together. I think most of the participating countries would agree that this work provided a great step forward in improving the overall environmental governance of the Danube," he says.

SPEAKING WITH ONE VOICE

In 1999, the GEF helped to establish the Danube Environmental Forum (DEF) as a platform for NGOs to develop a shared approach to the environmental protection of the Danube River. The DEF is now the umbrella organisation for the largest network of NGOs in the basin with a strong Secretariat, 174 member organisations and national representatives from 13 Danube countries.

The DEF continues to strengthen communication and cooperation between the NGO community, government agencies and the public.

"By partnering with a big transboundary body like the ICPDR the Danube Environment Forum enabled thousands of NGOs in the Danube basin to speak with one voice and have the ability to influence the bigger picture," Mr. Zavadsky says.

Every year the DEF also plays a lead role in the coordination of International Danube Day (June 29th). This regional event continues to expand in size and influence with each passing year. In 2011, more than 1,000 organisations and schools participated in hundreds of events in towns and cities along the River.

"By partnering with a big transboundary body like the ICPDR the Danube Environment Forum enabled thousands of NGOs in the Danube basin to speak with one voice and have the ability to influence the bigger picture."

IVAN ZAVADSKY, SENIOR WATER RESOURCES MANAGEMENT SPECIALIST, GEF INTERNATIONAL WATERS

The ICPDR also formed the Green Danube Partnership with Coca Cola to provide support for Danube Day and other activities to support better river basin management. In 2011, this partnership was shortlisted in the Best Collaboration category at the global Ethical Corporation Awards. Inspired by the success of the Green Danube Partnership, Coca-Cola has now launched programs to celebrate other rivers including the Volga, Dnieper, Sava, Tisza and Vistula.

SUPPORTING DIRECT COMMUNITY ACTION

In 2004, the GEF-funded, UNDP-implemented, *Danube Regional Project* started a GEF *Small Grants Programme* to support community action to address key problems such as nutrient pollution. This \$1 million program had a truly remarkable impact by awarding nearly 150 small grants of between \$5,000-15,000 to NGOs in 11 countries.

These projects helped to raise community awareness and support local action to improve farm practices, restore wetland areas and reduce wastewater pollution throughout the Danube basin. For example, with a grant of just \$10,000, the Moldovan village of Valea Mare was able to rehabilitate its wastewater treatment plant and significantly improve the quality of water

entering the Prut River. Results included a 70% increase in the level of water purification, a 20% decrease in the concentration of ammonium and a 30% decrease in the concentration of organic substances.

The *Valea Mare project* helped to raise public awareness about the impacts of nutrient pollution and train local school pupils on how to monitor the water quality and ecological health of the local riverbanks. It even worked to engage the mayors from six

neighbouring villages in an effort to share key learning with other communities living along the banks of the river.

In Sarajevo, another GEF *Small Grant Programme project* supported the NGO Ekotim to raise awareness among consumers about the links between their detergent use and water pollution from phosphates. The city's treatment facility had been destroyed during the war and untreated residential and industrial wastewater was pour-

Community action across the Danube River Basin, including here in Romania, has been vital to restoring the river's health, ICPDR

The Danube Delta, Romania, V. Melo



ing straight into the Miljacka River which feeds into the Danube.

The Romanian Government has now taken a \$68.1 million loan from the World Bank to scale up this best practice to reduce nutrient levels in 86 vulnerable sites across the country.

Ekotim's "No FOSFOS" campaign helped 200,000 Sarajevo consumers to understand the links between their detergent use and water pollution. As a result of the campaign a Bosnian company developed a new line of phosphate-free detergents, and post campaign testing of city wastewater showed the campaign reduced total phosphorus discharge to the river from 310 to 245 kg per day.

The GEF *Small Grants Programme* implemented by UNDP also provided funding for NGOs that worked together on cross border projects. One grant helped to support a new partnership between NGOs from four countries (Croatia, Bosnia & Herzegovina,

Slovenia, and Serbia) working to protect the Sava river basin.

Irma Popovic, from the Croatian NGO Green Action, says this partnership now provides NGOs with a permanent link into the work of the Sava Commission and the development of their plans for the river basin. "We now have a good relationship and communications with them which means Sava NGOs will be better placed to get their views and opinions heard in the future," she says.

REPLICATING SUCCESS

GEF support has enabled many Danube countries to pilot a range of projects and upscale successful efforts to reduce nutrient pollution at a national level.

One GEF/World Bank grant of \$5.15 million helped to support a \$10.8 million project to reduce nitrogen pollution from agricultural activities in Calarasi, Romania. The project supported the introduction of manure management and other environmentally friendly agricultural practices across an area of 410,000 ha of arable land bordering the Danube.

Before the project, manure had no perceived value among farmers and it was often simply left to wash away by itself. Also, due to a lack of proper manure storage facili-

ties that the community could share, many farmers had no alternative but to dump their waste on unauthorized dumping sites that were prone to leakage.

The GEF project helped to convince farmers of the financial and agricultural value of using organic manure instead of applying inorganic fertilizer. It also introduced a mandatory system for farmers to store their manure at communal sites.

Thanks to the project, the area achieved a 15% reduction in nitrogen and a 27% reduction in phosphorous entering the Danube. The land area covered by environmentally friendly practices increased from a baseline of zero to almost 35% and the amount of manure being applied as fertilizer increased from 2% to 34%.

The Romanian Government has now taken a \$68.1 million loan from the World Bank to scale up this best practice to reduce nutrient levels in 86 vulnerable sites across the country. The Government believes it is highly likely that the scaling up will be successful because neighbouring farmers have already asked for similar interventions based on the benefits they have seen delivered by the Calarasi pilot.

GEF DANUBE REGIONAL PROJECTS

AGENCY	PROJECT TITLE	APPROVAL DATE	GEF GRANT	TOTAL COST
GEF/UNDP	DANUBE RIVER BASIN ENVIRONMENTAL MANAGEMENT	1991	\$8.5M	\$43.5M
GEF/UNDP	DEVELOPING THE DANUBE RIVER BASIN POLLUTION REDUCTION PROGRAM	1996	\$3.9M	\$7.5M
GEF/UNDP	BUILDING ENVIRONMENTAL CITIZENSHIP TO SUPPORT TRANSBOUNDARY POLLUTION REDUCTION IN THE DANUBE: A PILOT PROJECT	2000	\$0.75M	\$1.6M
GEF/UNDP	TRANSFER OF ENVIRONMENTALLY-SOUND TECHNOLOGY (TEST) TO REDUCE TRANSBOUNDARY POLLUTION IN THE DANUBE RIVER BASIN	2000	\$0.99M	\$ 2.4M
GEF/UNDP	STRENGTHENING THE IMPLEMENTATION CAPACITIES FOR NUTRIENT REDUCTION AND TRANSBOUNDARY COOPERATION IN THE DANUBE RIVER BASIN	2001	\$17M	\$37.6M

TRANSBOUNDARY FRESHWATER RIVER BASIN PROJECTS

The GEF IW Focal Area has funded 40 projects involving 73 different countries with over \$227 million in GEF grants for a total of more than \$970.5 million for improving transboundary river basin management.

SIMILAR GEF BASIN PROJECTS

AGENCY	PROJECT TITLE	GEF GRANT	TOTAL COST
GEF/WB/UNDP	NILE TRANSBOUNDARY ENVIRONMENTAL ACTION PROJECT	\$23.5M	\$187.0M
GEF/WB	MEKONG RIVER BASIN WATER UTILIZATION PROJECT	\$10.8M	\$18.0M
GEF/UNEP	ADDRESSING TRANSBOUNDARY CONCERNS IN THE VOLTA RIVER BASIN AND ITS DOWNSTREAM COASTAL AREA	\$5.3M	\$16.2M
GEF/WB/UNDP	SENEGAL RIVER BASIN WATER AND ENVIRONMENTAL MANAGEMENT PROGRAM	\$7.3M	\$39.7M
GEF/UNEP	INTEGRATED AND SUSTAINABLE MANAGEMENT OF TRANSBOUNDARY WATER RESOURCES IN THE AMAZON RIVER BASIN CONSIDERING CLIMATE VARIABILITY AND CLIMATE CHANGE	\$7.0M	\$51.5M

Catalyzing Transboundary Management of the Lake Victoria Basin

Lake Victoria plays a vital economic role in East Africa. The fishing industry supports the livelihoods of three million people and contributes 2-3% to the GDP of the three largest riparian countries Kenya, Tanzania and Uganda. Over 30 million people depend on the lake for their freshwater supply and livelihoods. In addition, transport routes on the lake are critical for trade and the Lake Victoria Basin generates hydropower crucial for the region's economic development.

▲
Sunset over Lake Victoria adjacent
to the community car wash and fish
stalls, Kisumu, Kenya, A. Dansie



CATALYZING TRANSBOUNDARY MANAGEMENT OF THE LAKE VICTORIA BASIN

In recent years, the ecosystem of the Lake Victoria basin has been put under considerable stress from a variety of sources including, unsustainable fishing practices, untreated sewage discharge, the clearing of shoreline wetlands, over abstraction of water, land degradation, and the introduction of invasive weeds (such as water hyacinth) and fish species (such as Nile perch).

The cumulative impact of these threats is the severe deterioration of the Lake Victoria Basin ecosystem and the millions of livelihoods that depend on it. In the face of such pressures, Lake Victoria could become the catalyst for regional insecurity caused by competition and conflict over the use of dwindling shared natural resources.

This is just the type of situation where the GEF's focus on collaborative transboundary water resource management can provide the most benefit. Prior to 1995, the riparian countries had been unable to find an effective way to work together to manage the lake and its resources. There was very limited information about the entire lake ecosystem and there was no agreement on what the countries needed to do to protect it.

The GEF's work to foster collective action at

community, national and regional levels has helped these countries take important steps towards the effective transboundary management of the lake whilst building more stable relations, improving food security for local communities, and lessening the likelihood of conflict. As a result of the GEF's long-term commitment, other international partners such as the World Bank and the Swedish International Development Agency (SIDA) are now supporting the region to maximise the benefits of this collaboration.

ENABLING REGIONAL CO-OPERATION

Fish from Lake Victoria make a significant contribution both to regional food security (feeding 22 million people each year), and to national economies – 75% of the Nile perch landed are exported providing employment, income, GDP and foreign exchange worth at least \$400 million annually. GEF support has enabled countries and communities to protect this critical resource.

Through two GEF/WB *Lake Victoria Environmental Management Projects (LVEMP I & II)*, the GEF with WB implementation, worked with countries to build the

institutional foundations needed to support the transboundary management of the lake and its resources.

In its first project, the GEF supported the creation of important regional management mechanisms. For example, the Lake Victoria Fisheries Organization (LVFO) was established by treaty to provide a regional framework to ensure that decisions on fishery management are made with reference to the wider lake environment.

The GEF also supported a co-ordinated, region-wide data collection effort to fully understand the root causes of degradation of the lake, developing the confidence and shared understanding required for the countries to commit to working collaboratively to manage the lake. This trust led to the signing and ratification of a Protocol on Sustainable Development of the Lake Victoria Basin and the creation of the Lake Victoria Basin Commission by the riparian states laying down the principle that "partner states shall utilize water resources of the basin in their respective territories in an equitable and reasonable manner."

According to the Hon. Maria Mutagamba, the Ugandan Minister for Water and



▲ Management of Lake Victoria requires balancing sustainable use of resources both on the lake and in the surrounding catchment, A. Duda



▲ One of the Eco-San toilets built by the Entebbe Women's Association, A. Duda

SUPPORTING ECO-SAN TOILETS FOR LAKE VICTORIA'S FISHING COMMUNITIES

GEF has also supported a wide range of community-based demonstration projects that are being replicated by communities living on the shores of Lake Victoria. In Uganda, community consultations found that many people were increasingly concerned by negative impacts of untreated human waste on the coastal environment and public health. With support from the GEF's *Small Grants Programme*, the Entebbe Women's Association built new Eco-San (Ecological Sanitation) toilets at the Kigungu and Missoli landing sites. These demonstration toilets enabled more than 300 community members to receive direct training in the use and maintenance of Eco-San technology and helped generate demand for the toilets in other fishing villages right around the lake. Furthermore, cholera, which was present in the community before the sanitation was installed, has not returned.

Environment, the Commission, and a permanent regional institution of the East African Community, now provides, "... a cooperative management framework for the collaborating countries and institutions to sustainably manage Lake Victoria and its respective catchment."

Originally the Lake Victoria Basin Commission involved three main riparian countries but the GEF's WB-implemented *Lake Victoria Project* identified that the involvement of the upstream basin countries of Rwanda and Burundi was needed to ensure the successful environmental management of the lake. Now that the Commission has been expanded to include all five countries, they can collaborate more effectively to address shared problems such as the water hyacinth infestation which flows

down the Kagera River from these upstream countries.

The GEF also supports the Commission to ensure that the partner states use reliable environmental, health and natural resources data for policy decisions and planning the sustainable management of the basin ecosystem. A regional Transboundary Diagnostic Analysis has been vital in gaining agreement between the five countries on how to address the priority environmental issues facing the lake. This has resulted in a Strategic Action Plan for the lake that has been approved at the ministerial level by all five countries and endorsed by the East African Community.

According to Minister Mutagamba, "One of the most significant benefits [of the GEF's

support] was the establishment of a comprehensive regional water quality monitoring network of Lake Victoria comprising of 19 stations on the lake. This network, for the first time, enabled the regional scientists to characterize the lake dynamics and pollution levels."

"The Lake Victoria Basin Commission provides a cooperative management framework for the collaborating countries and institutions to sustainably manage Lake Victoria and its respective catchment."

HON. MARIA MUTAGAMBA,
UGANDAN MINISTER
FOR ENVIRONMENT

The GEF has also played a key role in strengthening institutional capacity and fostering good governance so the riparian countries can sustainably implement transboundary resource management.

This has included providing support for key implementation bodies such as the Regional Policy Steering Committee which brings together the ten permanent secretaries from the five countries to discuss the co-ordinated management of national resources and the harmonization of policies, legislation and regulatory standards. Minister Mutagamba believes GEF's work in this area has "provided the necessary ingredients for the revision of the water policy and legislation to reflect the required transboundary dimension, emphasizing co-operative arrangements".

SUPPORTING COMMUNITY BASED CO-MANAGEMENT OF FISHERIES

The GEF has fostered collaboration at a regional and national level, as well as providing direct support for local communities to play an active role in the management of the lake through the establishment of over 1,000 Beach Management Units (BMUs). BMUs are community-based organizations that bring together everyone involved in fisheries at the beach level – including boat owners, boat crew, traders, processors, boat construction and maintenance, fishing net repairers and others – to plan and manage fishing in their local area and work with government and other stakeholders in manag-

ing fisheries resources to improve the livelihoods of the community members.

This co-management approach has accrued a number of benefits for food security. The BMUs monitor fish stocks, protect breeding grounds, combat illegal fishing gear that catch juvenile fish, improve beach hygiene and ensure fish are of sufficient quality for the important export market. As Mr. Dick Nyeko, the Executive Secretary of the Lake Victoria Fisheries Organisation explains, "We can now demonstrate to the authorities in Europe that small scale fishermen can comply fully with the standards of international markets."

BMUs also provide the mechanism to resolve and diffuse cross border conflicts as their representatives are able to meet to negotiate and sign agreements. Mr Nyeko adds, "The BMUs help to reduce tension between fishing communities in border areas. We were able to translate the regulations of the partner states into local languages and distribute them through the BMUs so fisherman knew what rules everybody needed to comply with. This helped to increase understanding and reduce the potential for conflict."

According to Mr. Nyeko, BMUs are also a great example of the catalytic impact of the GEF's involvement and support.

"We can now demonstrate to the authorities in Europe that small scale fishermen can comply fully with the standards of international markets."

MR. DICK NYEKO, EXECUTIVE SECRETARY - LAKE VICTORIA FISHERIES ORGANISATION

"Because they have been effective at delivering community based collaborative fisheries management in Lake Victoria, BMUs have been given legal status in all the partner states of the East African Community and mainstreamed by ministers into national fishery policies. So now we don't just have BMUs in Lake Victoria, they have been established on the Indian Ocean coast and other on lakes such as Tanganyika, Nyasa, Turkana and Nakuru. In Lake Albert, the Ugandan BMUs have been copied by fishing communities in neighboring DR Congo. So The GEF's legacy is all over the territories of East Africa, and beyond!"

BIOLOGICAL CONTROL TO REMOVE WATER HYACINTH INFESTATION

The invasive South American water hyacinth (*Eichhornia crassipes*) was first reported in Lake Victoria in 1988. Since then it has spread across the lake, cutting off communities and putting the economic and food security of millions of people at risk. At times the lake is so choked by the weed that major transport routes are blocked and vital hydroelectric turbines become clogged. During an outbreak in 1997 the weed smothered 17,000 ha of the lake causing a 70% decline in the economic activity of the Kenyan port of Kisumu.

The weed also provides an immediate threat to lakeshore communities. In addition to fouling nets, clogging up motors and obstructing landings, the hyacinth also consumes available oxygen as it decomposes and destroys breeding grounds for fish. Because the weed provides a habitat for malaria-carrying mosquitoes and rotting plants contaminate drinking water, many fishing villages have had to be abandoned during heavier infestations.

The GEF/WB *Lake Victoria Environmental Management Project* succeeded in clearing the water hyacinth more cost-effectively than mechanical harvesters or aquatic herbicides by harnessing two natural enemies of the water hyacinth - the weed weevils *Neochetina bruchi* and *Neochetina eich-*

horniae. As a result of these efforts, between 1997 and 2005 the water hyacinth infestation was reduced by 85%, and at only one hundredth of the cost of mechanical removal, restoring the livelihoods of the affected communities.

At a community level, the network of BMUs established by the GEF project were used to help local people establish 15 weevil rearing units and conduct highly co-ordinated field releases which introduced 502 million weevils into the lake.

Collaboration between the riparian countries has also been vital in ongoing efforts to combat the hyacinth. At the request of Kenya and Tanzania, Uganda tested the biological methods before applying them in the lake. This voluntary cooperation and exchange of information contributed to Kenya and Tanzania adopting the same method.

Because the water hyacinth flows down the Kagera river from Rwanda and Burundi, the GEF project ensured that these countries were involved in the second GEF/WB *Lake Victoria Environmental Management Project* and supported their accession into the East African Community, the regional inter-governmental organization entrusted with the development of the lake.



▲ Weevil rearing station for eradication of water hyacinth, Yala Swamp, Kenya. C. Severin.

TRANSBOUNDARY MANAGEMENT SUCCESS IN LAKE TANGANYIKA

In recent decades, Lake Tanganyika, the second largest lake in the world by volume, has started to feel the environmental impacts of an increasing population.

Pollution from untreated wastewater and agricultural run-off, combined with over fishing and destructive fishing methods, is threatening the lake's biodiversity including more than 500 species that are endemic to the basin. The decline in water quality and fish stocks is also jeopardizing the health and livelihoods of the ten million people who live in the Tanganyika catchment.

Although the four riparian countries (Burundi, DR Congo, Tanzania and Zambia) had started to co-operate on fisheries, other aspects of lake management (biodiversity, water quality, pollution control etc.) had not been addressed at a regional level before the GEF International Waters area supported the GEF/UNDP *Lake Tanganyika Biodiversity Project*.

The project conducted a Transboundary Diagnostic Analysis that prioritised the shared issues affecting the lake and a Strategic Action Plan that identified the national actions and key institutions needed to resolve them.

Following this, and with the GEF's assistance, the four partner states negotiated and then signed the Convention for the Sustainable Management of Lake Tanganyika, a legal agreement to harmonize policies, laws, regulation monitoring, and information exchange.

Thanks to the in-depth consultation process facilitated by GEF, ownership of the Convention is highly accepted both nationally and regionally and the Authority is active in helping the partners address their complex pollution and fisheries issues.

It also established The Lake Tanganyika Authority, a regional institution charged with coordinating the management of the

lake. The Authority's management committee includes senior members of the relevant ministries in each of the four countries.

Thanks to the in-depth consultation process facilitated by GEF, ownership of the Convention is highly accepted both nationally and regionally and the Authority is active in helping the partners address their complex pollution and fisheries issues.

Building on this success, the GEF has supported the countries to develop pilot projects as part of the GEF/UNDP *Integrated Lake Tanganyika Management Program*. For example, improved sewage treatment is scheduled for Bujumbura, the capital of Burundi, and sustainable catchment management demonstration sites have been set up in Uvira (DRC), Kigoma (Tanzania) and Mpulungu (Zambia). Over 150 ha of seedlings have been planted in partnership with local farmers. In Zambia alone, 837 households are involved in alternative income generation to reduce environmental stress including beekeeping, vegetable gardening and aquaculture using endemic fish species, with significant increases in average incomes.

GEF SUPPORT FOR LAKE VICTORIA BASIN PROJECTS

AGENCY	PROJECT TITLE	APPROVAL DATE	GEF GRANT	TOTAL COST
GEF/WB	LAKE VICTORIA ENVIRONMENTAL MANAGEMENT	1996	\$8.5M	\$77.6M
GEF/WB	TRANSBOUNDARY DIAGNOSTIC ANALYSIS AND STRATEGIC ACTION PROGRAM DEVELOPMENT FOR THE LAKE VICTORIA BASIN	1996	\$1.0M	\$6.7M
GEF/WB	SIP-LAKE VICTORIA ENVIRONMENTAL MANAGEMENT PROJECT II	2008	\$6.8M	\$140.8M

TRANSBOUNDARY FRESHWATER LAKE BASIN PROJECTS

The GEF IW Focal Area has funded 19 projects in 29 different countries with over \$135 million in GEF grants for a total of more than \$429 million in transboundary freshwater lake basin investments.

SIMILAR GEF TRANSBOUNDARY LAKE PROJECTS

AGENCY	PROJECT TITLE	GEF GRANT	TOTAL COST
GEF/WB	LAKE OHRID MANAGEMENT	\$3.9M	\$25.3M
GEF/UNDP	PARTNERSHIP INTERVENTIONS FOR THE IMPLEMENTATION OF THE STRATEGIC ACTION PROGRAM (SAP) FOR LAKE TANGANYIKA	\$13.5M	\$58.2M
GEF/UNDP	INTEGRATED NATURAL RESOURCE MANAGEMENT IN THE BAIKAL BASIN TRANSBOUNDARY ECOSYSTEM	\$3.9M	\$15.0M
GEF/WB/UNDP	REVERSAL OF LAND AND WATER DEGRADATION TRENDS IN THE LAKE CHAD BASIN ECOSYSTEM	\$9.6M	\$12.7M
GEF/WB	LAKE SKADER-SHKODER INTEGRATED ECOSYSTEM MANAGEMENT	\$4.6M	\$16.2M



The Guarani Aquifer: Piloting New Legal Frameworks for Transboundary Aquifers

▲ Putting down a bore for use of groundwater from the Guarani Aquifer, GEF

The Guarani, the largest freshwater aquifer in South America, was named in 1996 after the indigenous people who have inhabited this region for centuries. In Brazil alone, the aquifer extends over 1.2 million km² - equal to the combined area of England, France, and Spain.



THE GUARANI AQUIFER: PILOTING NEW LEGAL FRAMEWORKS FOR TRANSBOUNDARY AQUIFERS

Professor Benedito Braga, the Vice President of the World Water Council, believes the GEF played a critical role in bringing together the countries of Argentina, Brazil, Paraguay and Uruguay to discuss the joint management of this important shared resource. As Director of Brazil's National Water Agency from 2001 to 2009, Professor Braga is well placed to comment on the role the GEF played in helping these countries to adopt the historic 2010 Agreement on the Guarani Aquifer.

"The GEF was very good at bringing professionals together discuss the hydrogeology of the aquifer itself - but it was also important in terms of involving other groups beyond national governments including civil society, academia and the provincial governments," he says

The Guarani Agreement is the first joint aquifer management agreement that is consistent with the 2010 United Nations Resolution on the Law of Transboundary Aquifers. It now provides an important model to help improve the management of other shared groundwater resources around the world. More than 97% of the Earth's readily accessible freshwater supply comes from underground aquifers. But, despite the

fact that almost 300 transboundary aquifers already provide water to hundreds of millions of people, there are only a handful of international agreements in place to help guide the shared management of this important resource.

The Guarani Agreement is the first joint aquifer management agreement that is consistent with the 2010 United Nations Resolution on the Law of Transboundary Aquifers.

The GEF/World Bank project titled *The Environmental Protection and Sustainable Development of the Guarani Aquifer System* lasted from 2003 to 2009. Before this project, most of the Integrated Water Resource Management (IWRM) efforts in the region had been devoted to surface waters, largely

ignoring one of the largest underground freshwater resources in the world. The \$27 million project included \$13 million from the GEF and \$14 million from the participating countries, the Organization of American States, and other donors.

Prior to the start of the Guarani project there was no regional framework to support the management of the aquifer. At current levels of exploitation it is estimated that the aquifer could offer the four overlying nations freshwater for over 2,000 years. But, with rapid increases in water consumption and the uncertainty posed by the impacts of climate change, the countries agreed to take a preventative approach to protect the Guarani.

The Guarani already supplies drinking water to some 15 million people including around 500 cities and towns in Brazil. As the country covering most of the Guarani, Brazil accounts for nearly 90% of the total water extracted from the aquifer and the state of São Paulo is by far the largest consumer. In the 1990s, pumping on border areas between Argentina and Uruguay had led to increased tensions while agricultural activities were threatening potential con-

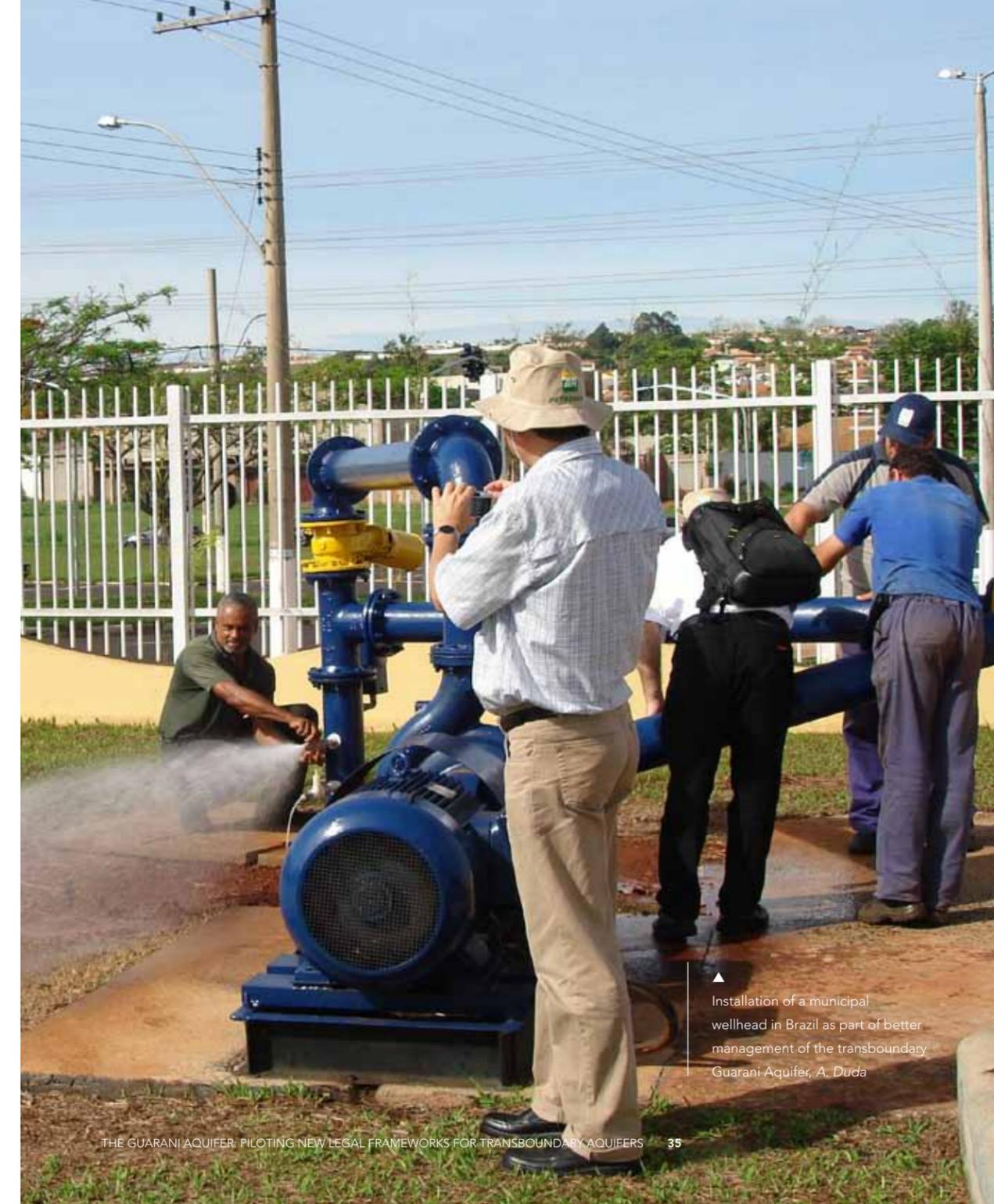
tamination of sensitive recharge areas in all countries.

The four countries approached the GEF for support to develop an integrated plan to protect and sustainably manage the aquifer. The objective of the GEF project was to "implement a shared institutional, legal, and technical framework to preserve and manage the Guarani Aquifer System (GAS) for current and future generations".

A Transboundary Diagnostic Analysis (TDA) was used to engage the technical community and enhance understanding of the aquifer system. Professor Braga says that this important scientific information finally provided different stakeholders and policy-makers with a better understanding of how the countries would need to collaborate to protect the aquifer.

"The name Guarani refers to a set of different aquifers that are close together. Nobody really understood how they were connected to each other but the GEF project promoted the need for further studies to understand its boundaries and flow patterns," he says.

The formulation of a Strategic Action Program (SAP) also helped to raise public awareness, increase stakeholder participation, and utilize existing political processes to help determine a shared vision for the



Installation of a municipal wellhead in Brazil as part of better management of the transboundary Guarani Aquifer, A. Duda



▲
Borders of Paraguay, Argentina
and Brazil at the confluence of the
Parana River and Iguazu River.

future transboundary management of the resource. Given the sheer size of the Guarani it was recommended that countries focus management actions on important recharge zones and sensitive border areas.

Professor Braga says the GEF project also helped to support greater coordination on groundwater management between national and provincial government agencies in Brazil.

"In Brazil, the Federal Government has no jurisdiction over groundwater but the GEF demonstration project helped the states to start talking to the national government and to each other about the joint management of the aquifer. I think the fact that we are learning within the Brazilian Government about the need to work together on the joint management of our groundwater is all a result of the GEF-WB *Guarani Project*," he says.

The GEF project enabled all the participating countries to establish National Inter-Ministry Committees to promote cross-sector action to protect the Guarani. Similar committees were also established in local Brazilian states to ensure a more integrated management approach by the many cities and towns that depend on the aquifer.

GEF also supported the development of four local level pilot projects designed to

demonstrate practical measures to reduce pumping in border areas and prevent the contamination of recharge areas from agricultural chemicals. The project also helped to build greater awareness among the wider public and indigenous communities. For example, a dedicated "Citizen's Fund" was established to encourage community based NGOs in their ongoing efforts to protect the groundwater system.

Professor Braga says the GEF project played a critical role in raising community awareness of exactly what they needed to do to protect their groundwater resources.

"For example, in the state of São Paulo we have very developed agricultural activities and this can pose some risks of contamination but the NGO community and the public are now very aware of the importance of protecting the recharge areas of the aquifer," he says.

As a result of the demonstration projects, all countries have now taken practical measures to protect the Guarani at the provincial and national levels. The city of Ribeirão Preto, one of the major water consumers in São Paulo, has established zone restrictions for wells. The Water Management Committee for Paraguay's Capibary watershed is working to remove potential hazards from soybean plantations. And, in Uruguay, funds have been invested to improve wastewater

treatment systems to avoid local contamination of the aquifer.

Mr. Jorge Rucks, the current Director of Uruguay's Environment Ministry, previously worked with the Organisation of American States, one of the key partners in the development of the GEF *Guarani Project*. He believes the demonstration projects provided a critical opportunity for the countries to work together to find pragmatic solutions.

"For example, the pilot in Salto-Concordia looked at the shared thermal tourism areas between Uruguay and Argentina. As a result of the project we know now that some new holes can be developed in parts of Argentina or Uruguay without putting problems on the dynamic of the aquifer. This tool for the management of the aquifer is very important for the relationship between the two countries because the tourist activity is very important for the economy of this area," he says.

Mr. Rucks says that one of the main results of the GEF-WB *Guarani Project* was to increase levels of confidence and trust between all of the participating countries.

"At the beginning we really didn't know if you dug a hole in São Paulo would this have an influence in "our" water in Argentina. Because of the project we now know in

technical terms that, due to dimensions of the aquifer, this is impossible," he says.

"If the Guaraní Project didn't exist these discussions would be impossible. I think it was a key factor in developing the understanding between the four countries of the need for more sustainable management of the aquifer."

MR. JORGE RUCKS, DIRECTOR,
URUGUAY MINISTRY OF
ENVIRONMENT

As a result of the GEF project all four countries that share the aquifer have also undertaken national reforms. Brazil has integrated groundwater considerations into its National Water Resources Plan with \$8.26 million allocated to support the implementation of its Surface and Groundwater Integrated Management Program. In Argentina, all six

Guarani Aquifer provinces are now represented on the Argentina Federal Water Resources Council. Paraguay's 2007 Water Resources Law now includes groundwater and Uruguay has established a national Guarani Management Unit. Mr. Rucks further comments, "If the *Guaraní Project* didn't exist these discussions would be impossible. I think it was a key factor in developing the understanding between the four countries of the need for more sustainable management of the aquifer."

A fine example of the "Community to Cabinet" approach, success in the Guarani

can be attributed to the GEF's simultaneous support of international, national and local measures. The conservation and protection of the groundwater supply have now been mainstreamed into both national and regional institutions to ensure that transboundary surface and groundwater are both addressed in a more integrated way. For example, the process of helping these countries work together to understand and manage the Guarani has also helped to build the trust needed to enable ongoing cooperation on the management of the shared La Plata River Basin, which does experience numerous water conflicts.

FORMULATION OF THE STRATEGIC ACTION PROGRAM FOR THE SHARED NUBIAN AQUIFER

The Nubian Sandstone Aquifer System (NSAS) occupies a surface area of about two million km² and underlies the countries of Chad, Egypt, Libya and Sudan. With an estimated volume of water of about 500,000 km³, the Nubian aquifer is one of the largest shared aquifers in the world. This aquifer is also highly significant due to the fossil nature of its water, the main source of which is rain that fell during the last ice age.

There is an increasing demand for this groundwater resource as it is the only significant water available for the growing population, and the region's industrial and agricultural sectors. A GEF funded grant of \$1 million supplemented approximately another \$1 million in co-financing from the International Atomic Energy Agency (IAEA), UNDP and UNESCO was provided for a joint project designed to address the pumping pressure on the aquifer and the transboundary impacts that could result from further water quantity or quality degradation.

This project was carried out using the GEF's TDA approach and has led to a Shared Aquifer Diagnostic Analysis (SADA). With the full cooperation of all countries, the SADA has formed the basis for developing a SAP addressing the key shared problems. This will be implemented under the auspices of a joint authority established by the four countries as a means of regional coordination.

CATALYTIC IMPACT ON THE PLATA RIVER BASIN

The Guarani Agreement is also important for the development of transboundary water management institutions for the Plata River Basin. The Plata is the fifth largest river basin in the world. It comprises almost all of the southern part of Brazil, the south-eastern part of Bolivia, a large part of Uruguay, the whole of Paraguay, and an extensive part of northern Argentina. In total, it accounts for 17% of the surface area of the South American continent, 50% of the five countries' combined population (including cities such as São Paulo and Buenos Aires), and 70% of their GDP. Water from within the basin provides recharge for the Guarani aquifer.

With the conversion of parts of the basin to soybeans and sugar cane, the development of very large hydropower dams that provide 80% of the power for the five countries, and encroachment on wide floodplains, the basin has become vulnerable to transboundary floods and droughts with very serious economic and social impacts.

The success of the GEF-WB *Guarani Aquifer Project*, which was based on the GEF's support for increased technical cooperation and stakeholder engagement, encouraged the governments of the five countries to approach the GEF with the idea of developing a transboundary project for extremely complex Plata basin.

As Mr. Jorge Rucks, Director of Uruguay's Environment Ministry explains, "In the design of the preparation of La Plata project there is a common understanding that the five countries of the basin need to work out how to deal with both the surface water and the groundwater. In a meeting of the Mercosur Presidents in the Summit of San Juan in Argentina, the Presidents agreed to create a specific institution for groundwater management, and particularly for the Guarani. But they put this initiative as a vision for the four countries of the Guarani in the framework of the Treaty of the La Plata Basin, which is a treaty of the 1960s to develop a system of institutions in this area."

The new GEF/UNEP *Plata Basin Project* is a model for future large basin projects and is designed to help the countries take a more integrated approach to management of its water resources in the face of increasing climatic change and variability. It is the first GEF IW project that has been explicitly designed to address flooding and climate adaptation issues while also dealing with the other transboundary concerns such as the linkage with the management of subsurface waters of the Guarani aquifer system.

Agriculture and land use changes in the Plata Basin combined with construction of large hydropower dams has resulted in increased vulnerability to transboundary floods and droughts, Northern Argentina



INTERNATIONAL COLLABORATION TO REDUCE THE POTENTIAL FOR CONFLICT IN THE NORTH WEST SAHARA AQUIFER SYSTEM

The North West Sahara Aquifer System (NWSAS) is shared by Algeria, Tunisia and Libya and covers an area of over one million km²

There is increasing demand on the aquifer's water resources from a rapidly growing population and the associated need to irrigate crops. The last two decades have seen a four-fold increase in pumping of water from the aquifer to the point that the water table is now falling. This has led to increased water costs, the loss of artesian wells and salinization.

In order to address these threats the three countries approached the GEF for support to develop the GEF/UNEP/UNESCO *Protection of the North West Sahara Aquifer System and Related Humid Zones and Ecosystems Project*. The project enabled the countries to develop hydrogeological models of the aquifer, establish monitoring systems and identify the priority issues that they needed to address. Crucially, the project also developed an international agreement among the respective Ministers

of Water for a Tripartite Mechanism of Joint Action. This commitment provided a firm foundation for cooperation among the three countries to address the transboundary risks affecting the NWSAS.

All these practical measures are helping to combat the deterioration of water quality, the salinization of groundwater and the destruction of oases.

Building on this historic agreement, a second GEF supported project is designed to enable the specification, agreement and implementation of joint, national, on the ground actions to address the key stresses on this shared resource. Pilot projects have been developed to test alternative irrigation methods and improve drainage systems to reduce levels of abstraction and protect

water quality. New cultivation techniques are also being demonstrated to reduce water consumption and regenerate degraded soils. All these practical measures are helping to combat the deterioration of water quality, the salinization of groundwater and the destruction of oases. The countries will share experiences and identify best practice from these pilots in order to upscale and replicate the results.

The countries will share experiences and identify best practice from these pilots in order to upscale and replicate the results.

The GEF's work on the transboundary North West Sahara aquifer system demonstrates its success in fostering multi-state cooperation and building regional capacity to develop and implement an agreed plan for sustainably managing water resources. This support will be vital in helping to reduce future levels of abstraction and the potential for any future conflict over access to this shared groundwater resource.

BALANCING WATER USES IN THE GUARANI AQUIFER SYSTEM

AGENCY	PROJECT TITLE	APPROVAL DATE	GEF GRANT	TOTAL COST
GEF/WB	ENVIRONMENTAL PROTECTION AND SUSTAINABLE INTEGRATED MANAGEMENT OF THE GUARANI AQUIFER	2001	\$13.4M	\$26.7M

GEF TRANSBOUNDARY AQUIFER PROJECTS

The GEF IW Focal Area has funded 13 projects in 31 different countries with over \$46 million in GEF grants for a total cost of more than \$146 million for improved management of transboundary aquifers.

SIMILAR GEF PROJECTS

AGENCY	PROJECT TITLE	GEF GRANT	TOTAL COST
GEF/UNDP/UNESCO	PROTECTION AND SUSTAINABLE USE OF THE DINARIC KARST AQUIFER SYSTEM	\$2.2M	\$5.4M
GEF/UNEP/UNESCO	REDUCING RISKS TO THE SUSTAINABLE MANAGEMENT OF THE NORTH WEST SAHARA AQUIFER SYSTEM	\$0.9M	\$2.7M
GEF/UNEP	MANAGING HYDROGEOLOGICAL RISK IN THE IULLEMEDEN AQUIFER SYSTEM	\$0.9M	\$1.8M



Demonstrating New Irrigation Technologies for Balancing Food Security, Water, and Environmental uses in the Hai River Basin

▲
Tributary of the Hai River, A. Duda

In order to provide food security for a growing global population, more and more water is being used to irrigate crops. In China alone, irrigated areas have increased by 160% to 580,000 km² the last 30 years. One of the country's most important agricultural and industrial regions, the North China Plain and the Hai River Basin, includes 134 million people and 7.5 million ha of irrigated areas.



DEMONSTRATING NEW IRRIGATION TECHNOLOGIES FOR BALANCING FOOD SECURITY, WATER AND ENVIRONMENTAL USES IN THE HAI RIVER BASIN

A successfully concluded GEF-WB *International Waters Project* in the Hai River Basin now provides a solution for the growing food, water and environmental conflict caused by over-irrigation in many places around the world. The project has shown that significant water savings can be made through a combination of innovative measures including satellite technology, economic incentives for water use, and institutional collaboration. The project, which ended in June 2011, achieved tremendous results including a 40% reduction in water use and up to five-fold increases in farm incomes. Unsurprisingly the project approach is already being replicated in other parts of China.

Unsurprisingly the project approach is already being replicated in other parts of China.

The project was the first large scale initiative in the world to combine remote sensing satellite technology and a new water allocation system with economic incentives together with the involvement of hundreds of local farmer-led associations, to ensure participation and compliance. The method, known

as ET (evapotranspiration) management, produced real water savings without crop loss and generated substantial gains in farm income.

The project, which ended in June 2011, achieved tremendous results including a 40% reduction in water use and up to five-fold increases in farm incomes.

Before the GEF project, wasteful irrigation in the Hai River Basin had resulted in serious environmental degradation. Groundwater was being extracted at a rate far beyond rechargeable quantities, reducing by 7.2 billion m³ a year, with water tables falling by 3 m every year. Rapid industrial growth had also created a serious water pollution problem in the water flowing from the Hai River to the Bohai and Yellow seas. This water,

which used to be full of micronutrients such as silicon that is vital for healthy coastal environments, now consisted largely of sewage and return water from irrigation. The combined impacts of water depletion and pollution meant that farmers faced severe threats to their economic security and communities were threatened by poisoned drinking water.

Following an approach from the Government of China, the GEF and World Bank developed the *Hai Basin Integrated Water and Environment Management Project* to promote effective water resource management and reduce the demand for water for irrigation. Alongside the UNDP/PEMSEA *Integrated Coastal Management Project* and the GEF/UNDP *Yellow Sea Project*, the GEF/WB *Hai River Basin Project* formed the land-based component of an inter-related regional program.

The traditional approach to water allocation had been based on withdrawals so there was no control over how the water was used. New criteria for water allocation were developed, including the amount of water consumed and the amount to be returned

to the local water system (with the water quality stipulated). The key to this approach was using satellite technology to measure ET (the sum of water lost through evaporation and plant transpiration) and estimate crop usage at a 30 by 30 m scale, therefore monitoring actual water consumed in different irrigated areas.

This data enabled a water usage quota to be set for each farmer-led water user association. The association in turn distributed the quotas to 360,000 individual farmer households along with a pre-paid pump card for accessing water. Once a farmer used up their allocation, the pump was shut down.

As a direct result of this new approach farmers changed their agronomic practices. Mulches and plastic were used to reduce evaporation from the soil, irrigation technology was adapted to drip systems, and cropping patterns changed from lower to higher value crops. The changes supported by the GEF project led to 40% reductions in water use and up to five-fold increases in farm incomes.

Under Chinese law all water allocations (well permits, water rights, and irrigation scheduling) are now based on this new ET remote sensing technology.

To ensure sustainable integrated water and environment management in the river basin,



▲ Changing agricultural practices supported by GEF have demonstrated reduction in water usage and increases in income. A. Duda

The GEF brought together the two critical ministries of the government, the Ministry of Water Resources and Ministry of Environment Protection, to work on integrated water management at the local level for the very first time.

Pollution discharges of human sewage were reduced by treatment initiatives in the Hai River Basin, A. Duda



the GEF facilitated the effective collaboration between the key stakeholders at all levels and improved institutional coordinating mechanisms. The GEF brought together the two critical ministries of the government, the Ministry of Water Resources and Ministry of Environment Protection, to work on integrated water management at the local level for the very first time. At a county level, inter-agency committees were established, improving local cooperation and integration of water resource management and pollution control activities.

A basin-specific Integrated Water Resource Management plan has now been produced following involvement from both ministries and local units of government. The plan, and local sub-plans, including the new water allocation system have been authorized under Chinese law and operationalized as part of the GEF project. The plans also ensure the important link between the river basin level institutions and the local water user level institutions is maintained so that water, agriculture, and environmental demands can be balanced.

As well as improving farmers' livelihoods, the GEF's approach to demand management in the Hai River Basin has delivered excellent environmental outcomes. By demonstrating the benefits of innovative technology, applying motivational economic incentives, ensuring collaboration among

national ministries and securing the participation of user communities, the 16 pilot counties have saved over 266 million m³ of water. Pollution loading into the Bohai Sea has also reduced by 38,615 tons/year for Chemical Oxygen Demand and 4,665 tons/year for ammonia-nitrogen.

The GEF's demand side approach to water use is a sustainable alternative to supply side solutions such as building more engineering works to transport water from great distances or deeper in the aquifer. As the Government of China prepares a package of financing to scale-up the results of the project in the Hai River Basin, these GEF supported measures at both a community and cabinet level, need to be applied globally to produce real water savings so that food, water, energy, and environment security needs can be balanced.

Pollution loading into the Bohai Sea was reduced by 38,615 tons/year for Chemical Oxygen Demand and 4,665 tons/year for ammonia-nitrogen.

BALANCING WATER USE, FOOD SECURITY, AND THE ENVIRONMENT: HAI RIVER BASIN

AGENCY	PROJECT TITLE	APPROVAL DATE	GEF GRANT	TOTAL COST
GEF/WB	HAI RIVER BASIN INTEGRATED WATER RESOURCES MANAGEMENT	2003	\$17.0M	\$131.5M

FOOD SECURITY AND AGRICULTURAL WATER PROJECTS

The GEF IW Focal Area has received many requests from recipient countries for projects to balance subsector water uses to reduce stress while improving agricultural income and production. These projects have demonstrated a range of measures from improved catchment management to more efficient irrigation technology, reuse of wastewater for irrigation, livestock pollution reduction, and sustainable land management. GEF international waters area has funded 38 agriculture-related projects involving 85 different countries with over \$232 million in GEF grants for a total cost of more than \$1.8 billion. Once countries commit to joint transboundary action GEF may follow up with single country national basin projects like the Hai Basin to promote the community to cabinet concept at the local level.

SIMILAR GEF AGRICULTURE-FOOD SECURITY PROJECTS

AGENCY	PROJECT TITLE	GEF GRANT	TOTAL COST
GEF/UNEP/OAS	IMPLEMENTATION OF STRATEGIC ACTION PROGRAM FOR THE BERMEJO RIVER BI-NATIONAL BASIN	\$11.0M	\$19.8M
GEF/WB/FAO	LIVESTOCK WASTE MANAGEMENT IN EAST ASIA	\$7.0M	\$24.6M
GEF/WB	ROMANIA: INTEGRATED NUTRIENT POLLUTION CONTROL PROJECT	\$5.5M	\$81.2M
GEF/WB	CHINA: SHANGHAI AGRICULTURAL AND NON-POINT POLLUTION REDUCTION PROJECT (SANPR)	\$4.8M	\$32.1M
GEF/UNDP	PROMOTING REPLICATION OF GOOD PRACTICES FOR NUTRIENT REDUCTION AND JOINT COLLABORATION IN CENTRAL AND EASTERN EUROPE	0.9M	\$2.5M

A wide, calm river flows through a lush, green landscape. In the foreground, a small boat with several people is moving across the water, leaving a white wake. The banks are lined with dense tropical vegetation, including palm trees. In the distance, a small settlement with buildings and a tall antenna tower is visible under a blue sky with scattered white clouds.

Water Security for Small Island Communities

“For most island nations even small variations in water supply can have a significant impact on the security of their communities with direct impacts on health, food production and economic development. In this light it is not surprising that a number of Pacific Island countries have sought support from the GEF to develop practical solutions needed to protect our fragile water supplies and the natural coastal defences upon which we depend.”

TUILOMA NERONI SLADE, SECRETARY GENERAL
OF THE PACIFIC ISLANDS FORUM SECRETARIAT

WATER SECURITY FOR SMALL ISLAND COMMUNITIES

Tuiloma Neroni Slade, the Secretary General of the Pacific Islands Forum Secretariat, served as Samoa's Permanent Representative and Ambassador to the United Nations from 1993 – 2003. During his time at the United Nations he was also the Pacific Island Countries representative on the Pacific/Indonesia/ Philippines constituency of the GEF Council and he is also a former Chair of the Alliance of Small Island States (AOSIS).

Mr. Slade considers that freshwater resources are particularly precious and important in small islands states given their limited size and vulnerability to drought, sea level rise, salt water intrusion, and the impacts from land use and coastal practices. He says that many island atolls have a single connected freshwater lens and once contaminated these can be extremely difficult to remediate and manage.

He believes that the GEF in its International Waters focal area plays an important role in the work undertaken to support better community-based management of watersheds and fragile coastal areas which also serve to strengthen the resilience of island nations to the impacts of climate change and extreme weather events.

"A number of GEF demonstration projects have highlighted the need to mitigate damage caused through ineffective management of our wastewater and some damaging land use and coastal management practices. It is extremely important to limit, and where ever possible prevent, further damage to our natural coastal defences including our fragile coral reefs and mangroves ecosystems," he says.

"For most island nations even small variations in water supply can have a significant impact on the security of their communities"

TUILOMA NERONI SLADE,
SECRETARY GENERAL, PACIFIC
ISLANDS FORUM SECRETARIAT

Mr. Slade says the GEF has played an important role in promoting greater cooperation and learning between the Pacific's island nations through regional bodies such as

the Pacific Regional Environment Program (SPREP) and Pacific Applied Geoscience Commission (SOPAC) which is now integrated into the Secretariat of the Pacific Community (SPC).

"There is no doubt that the work needed to protect our fragile coastal and watershed areas will need ongoing support and strong cooperation amongst regional agencies, international donors, civil society organisations and of course Pacific Island nations. A cornerstone of the GEF approach recognises that the key to long-term success lies in strong stakeholder collaboration and finding effective ways to help communities identify and understand their challenges and to take charge of implementing effective solutions.

"This approach of community ownership and empowerment is critical for sustainable development particularly given the unique communal ownership and land tenure systems in our Island communities. The GEF demonstration projects in the Pacific region clearly demonstrate that international funding can work in supporting our communities to take effective and sustainable action," he says.

The GEF/UNDP/SOPAC *Pacific Integrated Water Resources Management Program* (Pacific IWRM) includes a network of 13 surface and groundwater supply and community protection demonstration projects that have been developed following an assessment of the most significant water management issues in each of the participating countries.

DEVELOPING COMPOSTING TOILETS TO PROTECT TUVALU'S FRAGILE WATER SUPPLIES AND PUBLIC HEALTH

Some 1000 km north of Fiji, the nation of Tuvalu consists of eight small coral islands with a total population of just 12,000. Over 4,000 people live on the capital island of Funafuti and this community is regularly affected by long droughts. Rainwater is the only cheap and reliable source of potable water and the increasing cost of fuel means that the country relies on its desalination plant as an option of last resort.

As a direct result of the GEF/UNDP/UNEP *Tuvalu IWRM Demonstration Project*, there has been a remarkable increase in community demand for composting toilets. Tuvalu's Prime Minister, Willy Telavi, believes the GEF demonstration project will help to reduce water use and protect the health of his community. "We are very supportive of the



▲ Composting toilet road show on Funafuti Atoll, Tuvalu, P. Seleganiu



▲ Eco-San toilets play an important role in household water conservation in the Pacific, T. Chung

initiative for people to have access to composting toilets so we can reduce the use of water and the adverse impact of wastewater to our groundwater table," he says.

For more than ten years waterless sanitation has been recommended as the most appropriate technology for a fragile atoll system where flush toilets have already taken a heavy toll on the health of the community and the surrounding coral reef. But, despite the best efforts of donors and environment agencies, the local community continued to view the new composting toilets as no better than the old unhygienic pit toilets.

Today, however, there is long waiting list of families who were disappointed to miss out on the first 40 demonstration composting toilets that are being installed in volunteer homes. In a survey 530 households were asked directly if they wanted a composting toilet and 100% of the respondents answered a resounding, "Yes."

David Duncan, the GEF/UNDP/UNEP *Pacific IWRM Program*, believes this dramatic change of heart came about through a combination of excellent community engagement work and the harsh reality posed by ongoing droughts.

"The whole country recently declared a national state of emergency because of a water shortage and there has been a realisa-

tion that this would certainly have been alleviated to a degree if the country was using composting toilets. When the drought came along they suddenly went from being a nice idea to something that started to look like a must have," he says.

"We are very supportive of the initiative for people to have access to composting toilets so we can reduce the use of water and the adverse impact of wastewater to our groundwater table."

WILLY TELAVI, PRIME MINISTER OF TUVALU

Because flush toilets use up to 30% of household water, the widespread conversion to dry sanitation could have a massive impact on water conservation – especially for small island states. But for decades flush toilets and septic tank systems had been promoted on Funafuti as the most

safe and hygienic way to dispose of human waste. Now it has become clear that these systems are inappropriate for an atoll environment where pollutants can move easily between the groundwater system and the lagoon. Many of the existing septic tanks in Funafuti have been leaking into the groundwater system putting people at risk from hepatitis, typhoid, gastroenteritis and diarrhoea, especially during the flooding caused by king tides.

Mr. Duncan says the contaminated runoff from leaking septic tanks is also causing algal blooms that are killing the reefs surrounding Funafuti and destroying the fish habitats the island population relies on for food.

"As a result of the seepage from the septic tanks, they've seen a complete collapse of coastal habitats and an absence of fish. Many places like Funafuti are almost entirely reliant on the reef for their protein and this same situation is being faced by many other communities throughout the Pacific," he says.

He believes the success of the Tuvalu project couldn't have come at a better time for the entire Pacific Islands region where poor sanitation remains a serious health and environmental problem exacerbated by migration to population centres like Funafuti.

FIJI'S IWRM DEMONSTRATION PROJECT BRINGS AN INTEGRATED FLOOD RESPONSE TO NADI

In January 2009, a slow moving tropical depression passed over Fiji releasing almost four times the average monthly rainfall on the north-west of the country in just three days. According to Fiji's Meteorological Director it was the wettest January in over 100 years.

Nadi, on Viti Levu, Fiji's largest island, is the economic hub of Fiji and the centre of its tourism industry. The periods of intense rain saturated its catchment areas; rivers swelled and eventually flooded claiming 11 lives. At the height of flooding Nadi's central bus station was approximately six meters under water and Nadi International Airport was closed for 48 hours, stranding thousands of tourists.

The Pacific region is incredibly vulnerable to natural disasters but cyclones are by far the most common, accounting for nearly 80% of all reported disasters. These are fre-



Flood preparedness training in Nadi, Fiji, V. Kumar.

quently accompanied by floods which can cause major social and economic upheaval. The 2009 floods in Fiji caused an estimated FJD\$330 million in damage and lost earnings, equivalent to approximately 7% of the country's GDP. Climate change and variability is predicted to intensify and increase the frequency of high rainfall and cyclone events.

Pacific Island countries have traditionally been reactive rather than proactive in dealing with flood preparedness and response. The Fiji GEF/UNEP/UNDP IWRM demonstration project commenced in March 2009, just two months after flood waters receded. Its objective was to improve flood preparedness by introducing an integrated flood risk management approach within the Nadi basin.

The project has built on an earlier flood response system by installing a network of hydrological monitoring stations and it has worked with communities to build grass roots capacity to coordinate an early response. Communities have been assisted to develop their own disaster response plans and to practice their implementation. The project has also helped to coordinate government and non-government agencies by setting up the Nadi Basin Catchment Committee.

The impact of the project was clearly demonstrated when Nadi experienced serious flooding again in January 2012. The availability of real time hydrological data helped

communities and disaster response agencies to implement their response plans and minimize losses. According to Joeli Cawaki, Commissioner for Fiji's Western Division, public and agency response to the flood events were significantly improved as a result of the integrated approach facilitated by the Nadi demonstration project.

"The integrated approach is very much working for Nadi. It's a success in terms of the decision making. When to vacate the town, when to stop people from moving in and out, and also to make people aware when the Nadi river will burst its banks. The system is a success story for us. I think we need to do the same for the other bigger rivers in Fiji," he says.

Over the last decade the cultivation of sugar cane has crept higher up the mountain basins and deforestation for timber and wood chips has devastated upstream watershed areas. Increased sedimentation and storm runoff has increased the risk of downstream floods and degraded coastal reefs. Village fishermen are no longer able to catch fish for protein or sale because the rich mangrove wetlands have been cut, filled, and converted to vacation homes and resorts for foreigners.

The Fijian Government recognises that the GEF demonstration project will serve as the management model for other catchments in Fiji and legislation establishing an integrated approach to catchment management is currently awaiting proclamation.

Based on the breakthrough success of the Tuvalu project, other island countries such as Tonga and Nauru are also exploring if they can replicate the same sort of demand for composting toilets within their own communities.

ENGAGING A SCEPTICAL COMMUNITY

Mr. Duncan says a major challenge involved the community's initial misconception that composting toilets were basically just the same as the old drop pit toilets.

"The local project team realised that until you've got to a point where people say, "I really want one of those composting toilets, the whole discussion about replication and sustainability is a non-event," he says.

In order to try and overcome these misconceptions, and create a greater sense of community ownership, the project team held a national competition to find a new name for Tuvalu's new composting toilet design. The winning name, "Falevatie", which essentially means, "a toilet which saves water and is good for you and the environment," also helped to generate a high level of community awareness and curiosity about the project.

In order to develop the most locally attractive design for the falevatie, the project established a design committee to try and learn from the strengths and weaknesses of the few existing composting toilets on the island. The committee found that the most successful ones were used by large families who kept them well maintained and free from smell.

Because flush toilets use up to 30% of household water, the widespread conversion to dry sanitation could have a massive impact on water conservation

Mr. Duncan says the community was directly involved in the process of designing of the new falevatie. He says one of the most successful initiatives was a "Composting Toilet Road Show" where a demonstration toilet was placed on a float and taken directly to all the different communities on the island.

"The road show was fabulous because we were able to get people to see exactly what it looked like and they could find out for themselves that it didn't smell and a lot of

their concerns weren't as significant as they first thought. A big part of the road show involved creating an opportunity for people to look, touch, and laugh together about it. There was a lot of humour and banter and this really helped to make it normal for people," he says.

As a result of this community interaction and feedback further refinements were made to the design. Mr Duncan says the road show also resulted in over 60 volunteers coming forward to request composting toilets in their homes, a massive achievement when considering the initial negative perceptions about the technology. Mr Duncan says the next objective for the project team is to refine the design so it can be made more affordable for local families.

"In most Pacific Island countries it still costs between AU\$2,500-5,000 to put in a septic tank, so composting toilets could be a lot more affordable. But, it will be a bit of a juggling act to try and keep the price down while still encouraging people to view composting toilets as something that is really desirable for their families and the wider community," he says.

Mr. Duncan says that compost from the new toilets could help generate valuable soil in an environment where it is extremely difficult to grow fruit and vegetables.

“People are trying to grow crops on areas that are smaller than a bed using composted coconut husks because that’s the only organic matter they’ve got access to. When the project team had a community workshop people were initially quite reluctant to approach the composted soil until it was pulled out and they had a chance to see it for themselves. By the end of the session there wasn’t any left because it had been taken off to everybody’s gardens.”

EMPOWERING COMMUNITY-BASED WATERSHED MANAGEMENT IN JAMAICA

The watersheds and coastal areas of the Caribbean contain some of the most diverse and productive habitats including 13% of the world’s coral reefs. Some 30% of these reefs are now considered dead or at extreme risk because of human impacts such as untreated wastewater.

In the Caribbean the GEF-funded, UNDP/ UNEP implemented, Integrating Watershed and Coastal Areas Management (IWCAM) Project has helped to strengthen institutional frameworks for IWRM across 13 island countries. The program achieved significant results, including the declaration of a National Park to protect the recharge area for the underground water supply for the capital of St. Kitts and the development of

a new constructed wetland in St. Lucia that has significantly reduced pollution loading by 90%.

A major component of the IWCAM was the development of nine demonstration projects. All of these projects were carefully designed to ensure that any new management approaches could also be applied to meet the needs of other communities around the Caribbean.

In Jamaica, the GEF/UNDP/UNEP Drivers River Watershed Management Project has enabled the National Environment and Planning Agency (NEPA) to develop a practical and flexible model that is already being applied to improve the management of other watershed areas throughout the country. This new management model focuses on supporting government agencies to collaborate effectively so they empower watershed communities to introduce practical measures on a step-by-step basis.

The Drivers watershed is one of the most pristine watershed areas in the Caribbean. Located on Jamaica’s northeast coast, the parish of Portland has the highest rainfall on the island and it is well known for its lush vegetation and the production of bananas, coconuts, breadfruits, coffee, mangoes and ackee. With its fine beaches there is also a thriving tourism industry with a range of

hotels and world famous attractions like the Blue Lagoon and the annual Jerk Festival.

“The success of the project was based on taking a truly bottom-up approach that really focused on trying to understand the needs and priorities of the 25,000 people who live in the watershed.”

LISA KIRKLAND, PROJECT MANAGER,
DRIVERS RIVER WATERSHED
MANAGEMENT PROJECT

Project Manager, Lisa Kirkland, says the success of the project was based on taking a truly bottom-up approach that really focused on trying to understand the needs and priorities of the 25,000 people who live in the watershed.

“We started by listening to people so we could really understand the main things that were affecting them in their watershed.

After listening we knew that, if we could make the linkage between improving the environment and improving people’s way of life, we could motivate people to take action.”

“People have to feel that they are a part of the process and they have to believe that they will benefit by taking part. But it’s important that we don’t give them everything. They need to be the owners of the watershed and we need to find effective ways to let them have that ownership,” she says.

The project decided that the best approach was to encourage the community to identify their own priorities, find their own solutions, and work within the existing Parish Development Committee (PDC). The Drivers’ River Stakeholders Group was established and four sub-committees were set up to focus on four key areas: governance and enforcement; sanitation and sustainable livelihoods; environmental monitoring; and public awareness and education.

Community members were also trained to conduct a “Knowledge, Attitudes and Practices” (KAP) survey in order to gather relevant information about their own communities. A survey of 735 households identified community needs and motivations for involvement.



▲ Planting trees as part of watershed management in Jamaica, GEF



Due to a lack of environmental data the project worked with the Water Resources Authority and the Meteorological Services of Jamaica to get the community directly involved in measuring their water quality, quantity and the health of their mangroves and reef systems. Mrs. Kirkland says that community sampling at 29 marine and freshwater sites revealed some high levels of fecal contamination.

“Learning about the pollution really prompted the communities affected to make changes in their way of life and people stopped throwing diapers in the river. They also came up with their own solutions like clean-up days, community garbage collection and plans to remove things like pig pens from upstream areas,” she says.

FOCUSING ON SUSTAINABLE LIVELIHOODS

Mrs. Kirkland believes one of the projects’ greatest successes has been to influence the behaviour of more than 1,200 farmers throughout the Drivers River watershed and many of Jamaica’s other watershed areas. More than 20 farmer training days were designed to improve soil conservation practices and many farmers from outside the watershed came to see the benefits of these new practices in action.

Mrs. Kirkland says farmers were trained in basic composting, environmentally friendly pest control, and soil stabilization techniques involving the use of pineapple plants.

“The incentive for the farmers was they got seeds and some organic fertiliser and this directly impacted on their income. Seeds were sown and they produced excellent yields, crops were sold and this income allowed farmers to acquire more seeds. Hence the benefits obtained from these seeds kept revolving. When people started to see the benefits then everybody wanted to be a part of it. People were saying, “When are you coming back?,”” she says.

Following Tropical Storm Gustav in 2008, the project also distributed new fruit tree and coconut seedlings, and cassava sticks to farmers and other stakeholders to boost

reforestation efforts and to try and change damaging agricultural practices. Mrs. Kirkland says the aim of this intervention was to introduce farmers to modern farming techniques that were more environmentally friendly, while simultaneously providing a sustainable method of earning an income.

“We were able to introduce these new seeds and organic practices right after Tropical Storm Gustav. If we hadn’t gone in their incomes would have been wiped out and it would have taken a much longer time to start over. But the important thing is that we gave them things that they were interested in learning. We would say, “Do you want to know how to save your plants at the onset of a hurricane?” So the topics that we brought to the forefront were relevant to them. They were very curious and we equipped them with various things that they valued.”

“What I found out is that you can sit down and talk to people and listen why they are doing things their way. You don’t condemn them. You say, “Okay that’s your way but let’s see my way and at the end of the day you can choose which is the best method.” For example, many people didn’t know that organic fertiliser was so strong that mixing it with other soil is required on application; if this is not done the plant would be ‘burnt’. We taught them how this is done and as a

result farmers were able to get better produce,” she says.

“At one training day, a farmer came up to me and said, “Over the years we have been doing it this way but now that you have explained it we know the way we were doing it was wrong and we accept your way.” That was a huge thing for me to see that their entire way of life has been changed in terms of farming practices. Because of this work farmers were willing to travel for miles to look at what our farmers were doing. Previously we were told that farmers would never leave their areas so it was good for me to see them learning the various techniques and just listening to each other,” she says.

“The project also used a GEF *Small Grants Programme* project to catalyze other small business opportunities around environmental management initiatives. Many of these business projects helped to engage influential women’s groups as a way of facilitating greater capacity building and training in watershed management practices. For example, one successful project developed a business producing paper products from recycled paper, breadfruit and other fibre that now employs five people.”

MAKING IT FUN, EASY AND POPULAR

Mrs. Kirkland says the project used promotional concerts and school competitions to engage community members in a fun and interactive way.

“Before the environment was seen as negative and boring but we wanted to make it attractive and fun so people would want to be a part of it. In fact we wanted to make it so attractive that if they were not onboard then they would feel out of place. So we had a number of community events and concerts where people would go up and dance and sing all about the environment,” she says.

The Project also fostered a truly collaborative atmosphere between participating organisations and 98% of participating agencies expressed a willingness to continue working together in a similar manner in the future.

Mrs. Kirkland says the project worked with these partners to develop a collaborative Watershed Area Management Mechanism (WAMM) which has now been adopted by NEPA and is currently being rolled out in the remaining 25 watershed management units in Jamaica.

“Everything that was done in Drivers River was captured in a watershed model with ten

key components. We have now introduced it to four other watersheds and we are able to say “This is what we did, what do you think about it? Do you think it was a good idea? So far the reception to the model has being excellent. We allow stakeholders to choose if they would like the model implemented in their watershed and so it is not a situation of forcing the model on them,” she says.

Mrs. Kirkland believes that the community of the Drivers River Watershed have already shown that they are ready to continue the work of the project on their own.

“The community now understands the importance of sustainability and how taking care of the environment will benefit their health and their incomes. We have placed a real focus on providing training including proposal writing and fundraising to help our stakeholders function after the project has ended. I really believe that we have helped them reach a level where they can go out and fend for themselves.”

NEW ST. KITTS NATIONAL CAPITOL PARK PROTECTS BASSETERRE VALLEY AQUIFER

In June 2011, the Prime Minister of St. Kitts-Nevis, the Hon. Dr. Denzil Douglas, and other senior members of government gathered at the ceremony to mark the official designation of the St. Kitts National Capitol Park. This new National Park protects the Basseterre Valley aquifer which provides 40% of the island’s freshwater supply. This park covers approximately 2 km², including seven of the ten wells that withdraw water from the aquifer.

The aquifer produces about 9,500 m³ of water a day, but it is highly vulnerable to contamination. For many years sugar cane cultivation dominated the recharge area and now residential and commercial development is rapidly expanding up the valley. As a result, increasing levels of nitrates and other pollutants have been found in water samples taken from the area.

To ensure the aquifer continues to be a safe and reliable source of drinking water, the GEF/UNEP/UNDP *IWCAM* demonstration project was designed to help government and communities take practical actions to protect the aquifer. The

aquifer was mapped using Multi-Electrode Electrical Resistivity (MER), a non-invasive technique that accurately records variations in sediment distribution, porosity, and gross water quality.

St. Kitts National Capitol Park, a new National Park protects the Basseterre Valley aquifer which provides 40% of the island’s freshwater supply.

The project also partnered with the St. Kitts Electricity Department to install an Oil/water separator at the Needsmust Power Plant. This activity has reduced the threat to the aquifer and the adjacent coastal area by intercepting oily waste before it is discharged. In the first few months over 3 m³ of waste had been intercepted and pumped from the separator for safe disposal.

SMALL ISLAND DEVELOPING STATES, DRINKING WATER PROTECTION, AND WATER QUALITY MANAGEMENT

AGENCY	PROJECT TITLE	APPROVAL DATE	GEF GRANT	TOTAL COST
GEF/UNEP/UNDP	INTEGRATING WATERSHED AND COASTAL AREA MANAGEMENT IN THE SMALL ISLAND DEVELOPING STATES OF THE CARIBBEAN (IWCAM) INVOLVES 13 CARIBBEAN COUNTRIES.	2004	\$13.4M	\$113.0M
GEF/UNDP/UNEP	IMPLEMENTING SUSTAINABLE INTEGRATED WATER RESOURCE WASTEWATER MANAGEMENT IN THE PACIFIC ISLAND COUNTRIES; INVOLVES 14 PACIFIC ISLAND COUNTRIES.	2008	\$9.0M	\$58.4M

GEF SIDS AND WATER QUALITY PROJECTS

The GEF IW Focal Area has funded 13 projects involving 39 different SIDS with over \$113 million in GEF grants for a total cost of more than \$708 million. To address water quality, the GEF has funded 42 projects involving 73 different countries with nearly \$259 million in GEF grants for a total cost of more than \$3.5 billion in water quality improvements.

SIMILAR GEF PROJECTS

AGENCY	PROJECT TITLE	GEF GRANT	TOTAL COST
GEF/UNEP/UNDP	IMPLEMENTING INTEGRATED WATER RESOURCE AND WASTEWATER MANAGEMENT IN ATLANTIC AND INDIAN OCEAN SIDS	\$9.7M	\$26.7M
GEF/WB	BULGARIA: WETLAND RESTORATION AND POLLUTION REDUCTION PROJECT	\$7.5M	\$13.3M
GEF/WB	BOSNIA-HERZEGOVINA: WATER QUALITY PROTECTION PROJECT	\$8.5M	\$20.6M
GEF/WB	TUNISIA: NORTHERN TUNIS WASTEWATER PROJECT	\$8.0M	\$555.8M
GEF/UNDP	POLLUTION CONTROL AND OTHER MEASURES TO PROTECT BIODIVERSITY IN LAKE TANGANYIKA	\$10.0M	\$10.0M



Improving Water Quality with Innovative, Low-Cost Constructed Wetlands

▲ Household level constructed wetland in Au Leon, St Lucia under construction, IWCAAM Project

From Kenyan prisons to large Chinese cities, a number of GEF pilot projects have shown that constructed wetlands can provide a low-cost wastewater treatment option and improve water quality for a wide range of communities. After the GEF's work to spearhead the development of this new technology similar wetlands are now being replicated elsewhere, including a Norwegian-funded project in the Madagascan city of Toliare.



IMPROVING WATER QUALITY WITH INNOVATIVE, LOW-COST CONSTRUCTED WETLANDS

In some poorer countries, and in those facing rapid urbanisation and population growth, the lack of effective wastewater management systems means that domestic, agricultural and industrial effluent can flow directly into fresh and marine water systems. This pollution can lead to serious public health problems, a reduction in fish stocks and a loss of biological diversity.

The vegetation and micro-organisms in constructed wetlands imitate the role of natural wetlands by working as a biofilter to remove excess nutrients, sediment, and heavy metals and toxins from the wastewater. Construction, operation and maintenance costs are lower than other treatment options and they can provide additional benefits such as the creation of wildlife habitats and the ability to re-use water for aquaculture.

IMPROVING LIVELIHOODS AROUND LAKE MANZALA

Lake Manzala in Egypt is a long, shallow lake on the north eastern edge of the Nile Delta between the two port cities of Dormietta and Port Said. Much of the heavily polluted drain water crossing the delta enters large coastal lakes, such as Lake Manzala,

before flowing into the Mediterranean Sea. Contaminated water and tainted fish stocks in the lake represent huge risks to public health and the ecosystem.

In a GEF supported, UNDP implemented, project 0.24 km² of constructed wetland treats up to 50,000 m³ of water per day, removing 90% of traditional pollutants and 75% of toxins. The cleaner water is then used in ponds where local fishermen can farm fish that are fit for human consumption and that can also be used to restock the lake. The benefits are summed up by Project Director Dr. Diaa el-Quosy.

In a GEF supported, UNDP implemented, project 0.24 km² of constructed wetland treats up to 50,000 m³ of water per day, removing 90% of traditional pollutants and 75% of toxins.

“This technology costs only 10% of other technologies, it is environmentally friendly as no chemicals are used and the maintenance of this technology is very simple. The community knows about this new technology, by breeding fish we are creating a stock that can be used to produce more fish,” he says.

IMPROVED PUBLIC HEALTH FOR EAST AFRICAN COASTAL BASIN COMMUNITIES

As part of their GEF/UNEP *Addressing Land-Based Activities in the Western Indian Ocean project (WIO-LaB)* the GEF has funded constructed wetlands to address the challenge of wastewater management in the increasingly populated but still poorly developed coastal urban centres in East Africa.

The population of Chake-Chake, a town on Pemba Island in Tanzania, had frequently experienced health hazards caused by free-flowing sewage and flooding. A GEF funded, UNEP implemented, project supported construction of a 12 km long sewer system to collect wastewater from households, restaurants, mosques, and other sites and a constructed wetland to treat it. The

site was covered to avoid mosquitoes and located next to a natural mangrove wetland area to help it blend in with the natural environment.

The high level of local support for the project was demonstrated when two communities of Msingini and Kichungwani chose to provide co-financing of \$60,000 from their annual contribution from the Tanzania Social Development Fund.

The resulting elimination of untreated wastewater discharge has enhanced environmental conditions in the nearby coastal waters and public health has improved for the 4,000 people living in the project areas.

The 150 residents of the housing estate at Brilliant on Mahe, Seychelles were also used to living amongst untreated wastewater as the original infiltration system, ineffective due to the hard rock on which the estate was built, was frequently breaking down causing nuisance and significant health risks. This is a typical situation for many other housing estates in Seychelles that are beyond the sewers of Port Victoria and reliant on septic tank systems.

The GEF demonstration project designed and built a successful, technically simple, low energy use and low cost constructed wetland treatment system, appropriate for the size of, and situation at, Brilliant. The

project also contained training for government officials and local contractors, enabling the approach to be replicated at other housing estates in Mahe and on other islands.

An inadequate wastewater system had also posed significant health risks for the 2,500 inmates and 1,500 staff at Shimo La Tewa prison in Mombasa, Kenya. Raw sewage was entering the Mtwapa Creek just 500 meters from the Indian Ocean. “The smell is very bad,” said Sergeant Paul Cheruiyot a worker at the prison. “It was hard to work near here. People passing on the road outside the fence complained too. There was public outcry”. The situation was so bad that Kenya’s National Environmental Management Authority sued the prison for polluting surface waters.

A GEF-supported project, the first of its kind in Kenya, helped to develop a constructed wetland that treated the water with a cost per person served of just \$25, and with less maintenance requirements than systems using pumps and chemical treatment.

As well as improving sanitary conditions and the ecosystem, the project also provided the added benefit of recycled wastewater for irrigation and aquaculture at the prison. In order to ensure sustainability staff training has enabled the prison to maintain the system as part of its usual maintenance activities. It now serves as an example of best

practice in sanitation in prisons in Kenya and has attracted a high level of interest from Government and other stakeholders from throughout Kenya and beyond.

COMMUNITY INVOLVEMENT TO BUILD A CONSTRUCTED WETLAND IN ST LUCIA

The Fond d’Or Watershed in the Caribbean island of St Lucia faces serious water quality problems exacerbated by the lack of adequate waste storage and treatment facilities for, occasionally unplanned, residential developments. Due to the topography and geology of the area, many houses have been built directly on exposed bedrock and shallow and fragile soils. This means that soakaway pits are not effective and untreated domestic waste enters gutters and gullies, and contaminates river water with fecal matter.

As people living in the watershed have no option but to use the rivers for bathing and washing, there is real concern about the threat to public health, so the GEF/UNDP/UNEP *Integrating Watershed and Coastal Area Management (GEF-IWCAM) Project* used constructed wetlands address the domestic waste problem for the Au Leon community.

The constructed wetland solution needed the buy-in and ownership of the local population. At an early stage, informal meetings were held with the community, to discuss the problems of wastewater treatment and disposal, as well as potential solutions for addressing the problem. Following these meetings a number of community members decided to come together to form the Au Leon Constructed Wetland Project Committee to oversee the implementation of the wastewater treatment system. The Committee took responsibility for educating residents about waste management and selecting which households would benefit from the demonstration project.

The project designed a Wastewater Wetland Treatment System specifically for Au Leon. The system which costs around \$1,600 to build from locally accessible materials treats wastewater from four households to advanced secondary water quality levels, with plants playing a significant role in the process. In the demonstration project four wetland systems were constructed within Au Leon including one which services public toilet. The early results from these systems showed a reduction in both the fecal coliform bacteria and Biochemical Oxygen Demand (BOD) in the local rivers.

The GEF supported *Au Leon project* has demonstrated that constructed wetlands offer an innovative solution to the problems

of treating and disposing of domestic wastewater in communities built on hard rock overlaid by shallow soils, a common situation in Saint Lucia. As a result the Ministry of Agriculture Forestry and Fisheries has supported the introduction of this technology to other rural areas on the island with similar geological constraints.

NEW ENVIRONMENTAL BENEFITS FOR CIXI CITY

Unprecedented economic growth in East Asia has resulted in rapid urbanization and population increases, particularly in coastal cities. The region's seas, coasts, estuaries and rivers have borne the brunt of this expansion with land-based pollution causing significant environmental degradation.

In Ningbo Municipality, 175 km south of Shanghai, investments in water supply and pollution control have lagged far behind rapid economic development. In Cixi City, home to around one million people, only 10% of wastewater was being treated and heavy pollution loads were flowing directly to the environmentally sensitive Hangzhou Bay. To address this problem the GEF provided support for the World Bank implemented GEF/WB *Ningbo Water and Environment Project* to reduce land-based pollution along the Cixi coast.

In some Chinese provinces, attempts to introduce advanced wastewater treatment technologies have been hampered by the impacts of unforeseen operational and maintenance costs. With the GEF's support however, Cixi City has managed to generate a number of benefits by constructing a world class wetland for the final treatment of 100,000 m³ of wastewater every day.

In addition to pollution reduction the project has resulted in the provision of a range of new environmental amenities including wetland restoration and the development of a wetland education centre for citizens and visitors. The development of this project was also specifically designed to involve a wide group of local stakeholders that have been working on pollution and conservation issues in Hangzhou Bay including government, NGOs, key research institutes and universities.

The early results have been positive. The constructed wetland has successfully reduced total phosphorous pollution by about 50% and is removing 30% of the total tonnage of nitrogen and Biochemical Oxygen Demand, pollutants that would have otherwise reached Hangzhou Bay.

▲ Large constructed Wetland at Lake Manzala, Egypt, removing up to 99.7% total Coliform bacteria, *M. Atallah*



▲ Construction of a medium-sized wetland system at Brilliant Housing Complex, Seychelles (WIO-LaB), F. Joubert

The constructed wetland has successfully reduced total phosphorous pollution by about 50% and is removing 30% of the total tonnage of nitrogen and Biochemical Oxygen Demand, pollutants that would have otherwise reached Hangzhou Bay.

The new wetlands have also visibly improved biodiversity and attracted a large number of migratory and resident bird species. In recognition of these efforts the area has been now designated as a National Wetland Park by the State Council.



▲ Medium sized constructed wetland system at Brilliant Housing Complex, Seychelles, removing up to 80 % of BOD as part of the WIO-LaB project, F. Joubert

A glass globe of the Earth, showing continents and oceans, is placed on a mossy rock. In the background, a waterfall flows down a rocky cliff. The scene is brightly lit, suggesting a sunny day.

Replicating and Scaling-up Transboundary Success

In its first two decades the GEF International Waters focal area has helped many countries take joint actions on transboundary rivers and aquifers that have secured multiple benefits for their communities and economies. Failure to support the widespread replication of the successes outlined in this booklet will only strengthen the likelihood of increased conflict over our shared freshwater resources.

REPLICATING AND SCALING-UP TRANSBOUNDARY SUCCESS

Twenty years on from the 1992 Rio Summit, there is now a newfound understanding that increased climatic variability and global economic policies have combined to threaten our communities and the water environment on which we all depend.

Just 20 years ago, the GEF International Waters focal area was created because unilateral, single-sector investments by governments were depleting and degrading national and transboundary water resources. Now, in addition to these difficult water conflicts, the world community must invest additional effort in adaptive management measures to mitigate the impacts of floods, droughts and inescapable global economic pressures.

Our water resources lie at the centre of serious conflicts relating to food, energy, health, economic development and environmental security. And these conflicts have devastating implications for global commodity prices and developing economies. The GEF International Waters focal area has responded with hundreds of millions of dollars of grants for country-requested action to help balance water uses in strategic transboundary basins and aquifers.

In places like South America's La Plata Basin, climatic shifts toward serious droughts and

floods are now occurring amidst multiple sources of water conflicts. In response, the countries requesting GEF resources are using them to resolve their transboundary issues and establish a more cooperative framework. (See box on page 75)

Many countries are using the GEF as an independent third party to support transboundary legal agreements, cooperative frameworks, and joint management institutions from the great river basins of the Danube and the Amazon to the lake basins of Lake Victoria and Lake Baikal. With 97% of all non-frozen freshwater in aquifers, countries are now replicating these frameworks and joint institutions for transboundary aquifers like the Guarani and the Northwest Sahara.

This booklet is titled "From Community to Cabinet" for good reason. Each transboundary GEF International Waters project supports direct community action to address a particular priority transboundary concern or opportunity that has been identified by the participating countries. Time and again this local action has provided concrete benefits that cabinet ministers can then use to support the national sector reforms necessary for replicating this successful action in other communities. At the same time GEF supports top-down multi-country collaboration

to address that scale of activity so that vertical linkages can be developed among the three scales of effort: multi-country, national sector, and community.

Many countries are using the GEF as an independent third party to support transboundary legal agreements, cooperative frameworks, and joint management institutions from the great river basins of the Danube and the Amazon to the lake basins of Lake Victoria and Lake Baikal.

It is GEF's experience that funds only devoted to the local level, national level or transboundary level will not meet sustainable development goals or relieve the water

stress at the centre of food, energy, water, and environment security conflicts.

It takes action at all three scales simultaneously to achieve sustainable institutional changes. It takes time, sometimes decades, for political considerations to adjust and institutions at these different scales to be established and become effective through vertical linkages between them. But the GEF's integrated "Community to Cabinet" approach represents the only pragmatic approach capable of success for these complex, cross-border water systems.

The International Waters focal area has also provided a priority on actions under Chapter 18 of Agenda 21, and in particular enhanced assistance to the Small Island Developing States (SIDS). Regional projects with UNDP and UNEP for the Pacific, the Caribbean, and the Africa-Indian Ocean have helped to protect surface and aquifer drinking water sources in 35 different small island nations. These demonstration projects have been accompanied by other projects to protect community security such as the case of flood protection in the Nadi river basin in Fiji.

The International Waters focal area has also fostered South-to-South exchanges as an important way to build capacity, accelerate project implementation, and enhance impacts as part of its strategy. GEF IW:LEARN is a key resource that continues to help GEF agencies to benefit from learn-

ing through communities of practice, targeted workshops, conferences and information management. (See box on page 77)

The experience of sharing learning across GEF projects is clear. The experiences from the Guarani Aquifer system have been shared globally while the participating countries have learned to build on their successful collaboration to address the overlying La Plata Basin. Similarly, the quick action taken in Fiji to protect the poor and their belongings from the devastation of floods can be understood and replicated for other vulnerable communities around the world through IW:LEARN Communities of Practice.

Other GEF focal areas, such as climate change and biodiversity, can sometimes appear to be more politically popular. But water is truly central to any considerations about energy, food, community well-being and the health of the wider environment. In its first two decades, the GEF International Waters focal area has helped countries to understand the central role of water and to develop joint commitments and actions that have secured multiple benefits for their communities and economies.

GEF allocations to international waters cannot meet the deluge of new requests for projects given the awakening of governments to the new realities of water conflicts amidst a changing climate and complex global economic pressures. But without



widespread replication of many of these success stories, the tipping point on the global water crisis will be reached very soon with grave consequences for both social order and the global economy.

The GEF International Waters focal area has catalyzed transboundary political agreements for action, cooperative legal frameworks, joint institutions for sustainability, national sector reforms, and impressive community action. With social unrest increasing from the food, energy, and water conflicts and grave warnings about a changing climate, the time for replication and scaling up is now! Inaction is no longer an option.

We all need food for our families, safe drinking water, and incomes sufficient to support us along with energy, shelter, and protection from floods, droughts, and storms. These essentials of life are at risk in many countries as a result of poor water policies and programs, increasingly severe weather

▲
A. Dansie



▲ Community Engagement of all stakeholders is an important component towards successful implementation, CALLC Project

events, and pressure from the globalization of national economies. The lack of water will likely destabilize some countries, and others may use water or interference in water development as a weapon for political purposes in transboundary situations. As the GEF looks towards a future of increased floods, droughts, and water use conflicts, the needs of recipient countries to better manage their surface and subsurface water resources will only become more frequent and urgent. But this future does not have to be so gloomy. Countries have taken important steps toward a water secure future in GEF international waters projects, and GEF with its agencies stand ready to help countries scale up their successes. GEF is at the center of development assistance efforts to balance competing water uses with integrated water resources management tools, capacity building through networks of practitioners in GEF IW:LEARN, and demonstration investments at all scales from communities to cabinet. For those countries that integrate water into their strategies for agriculture, energy, health, and environment and scale-up their GEF successes, a sustainable future lies ahead. For those that do not, there is a future of cross-sectoral water conflict, political instability, and challenges for keeping pace with the new, globalized and warming world.

EL NINO, FLOODS AND DROUGHTS COMPLICATE LA PLATA BASIN MANAGEMENT

El Niño, the periodic warming of the Central Pacific Ocean, has been associated with consistent patterns of drought and floods around the world. However development assistance organizations and national governments have ignored patterns like those affecting the La Plata River Basin, where floods during El Niño years and droughts during La Niña years have occurred for hundreds of years on record.

During El Niño years the Amazon rains move south into the La Plata Basin. Statistical analyses of precipitation in El Niño events dating back to 1877 have been undertaken in the La Plata Basin. Floods resulting in billions of dollars or damages have been associated with the two most powerful El Niño events on record since 1877 (1982-1983 and 1991-1995) as well as additional floods after the warmest year on record for the 20th century in 1997-1998.

Other factors compounding the difficulties in this important basin include the development of hydropower dams, the conversion of forests to agriculture, and the occupation of floodplains. The increasing threat has shown the five basin countries that a transboundary institution originally negotiated in the 1960s now needs to be revitalized and modernized to address the 21st century water and land conflicts that threaten their economies and communities.



▲ The Itaipu Binacional Dam on the Rio Parana is the world's largest power plant, located on the border between Brazil and Paraguay

The 'Community to Cabinet, Two Decades of GEF Action to Secure Transboundary Basins and Aquifers' publication was produced as an activity under the Full-Sized Project 'MENARID GEF IW:LEARN –Strengthening IW Portfolio Delivery and Impact' (GEF ID 4219), in partnership between the Global Environment Facility (GEF), the United Nations Development Programme (UNDP), the United Nations Office for Project Services (UNOPS) and the United Nations University Institute for Water, Environment and Health (UNU-INWEH).

Partner websites:
 GEF IW www.thegef.org
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 UNDP www.undp.org
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THE GEF AND GEF AGENCIES

The Global Environment Facility (GEF) unites 178 member governments — in partnership with international institutions, non-governmental organizations, and the private sector — to address global environmental issues. An independent financial organization, the GEF provides grants to developing countries and countries with economies in transition for projects related to biodiversity, climate change, international waters, land degradation, the ozone layer, and persistent organic pollutants. These projects benefit the global environment, linking local, national, and global environmental challenges, and promoting sustainable livelihoods.

Established in 1991, the GEF is today the largest funder of projects to improve the global environment. The GEF has allocated \$8.3 billion, supplemented by more than \$33 billion in cofinancing, for more than

2,225 projects in more than 165 developing countries and countries with economies in transition. Through its Small Grants Programme (SGP), the GEF has also made more than 10,000 small grants directly to nongovernmental and community organizations.

The GEF partnership includes 10 agencies: the UN Development Programme; the UN Environment Programme; the World Bank; the UN Food and Agriculture Organization; the UN Industrial Development Organization; the African Development Bank; the Asian Development Bank; the European Bank for Reconstruction and Development; the Inter-American Development Bank; and the International Fund for Agricultural Development. The Scientific and Technical Advisory Panel provides technical and scientific advice on the GEF's policies and projects.



▲ Meeting participants at the sixth Biannual International Waters Conference, October 2011 in Dubrovnik, Croatia, M. Gudczinski.

IW:LEARN ENHANCES PROJECT IMPACT AND GLOBAL TECHNOLOGY TRANSFER

In 2000, IW:LEARN was established as the International Waters Learning Exchange and Resource Network for the GEF, the UNDP and the UNEP. It provides a critical role in helping to share project experiences, foster learning, and enhance project impacts across over 250 GEF International Waters projects worth a total of over \$8.4 billion.

IW:LEARN promotes knowledge sharing and technology transfer across GEF agencies, countries, and partners around the world. Its work to promote networking and peer to peer learning helps to share best practices and improve the quality of all GEF international waters projects. By supporting Communities of Practice for both transboundary freshwater basins (UNDP and IUCN) and aquifer systems (UNDP and

UNESCO IHP), IW:LEARN also helps projects and countries to develop more integrated policies.

To find out more about IW:LEARN, including events, guidance and project details visit: www.iwlearn.net/abt_iwlearn.

The GEF International Waters Portfolio 1991 - 2012

